EDISON ELECTRIC INSTITUTE BULLETIN

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EDISON ELECTRIC INSTITUTE

THE ELECTRIC LIGHT AND POWER INDUSTRY

Current Statistical Data Covering 100 Per Cent of Industry

JANUARY, FEBRUARY AND MARCH 1939

	January	February	March
	SOURCE OF ENERGY		
Kilowatthours Generated (Net)			
By Fuel Burning Plants	6,609,197,000	5,575,982,000	5,849,110,000
By Water Power	3,382,704,000	3,493,520,000	4,089,800,000
Total Generation	9,991,901,000	9,069,502,000	9,938,910,000
Net Purchases			
From "Other Sources"	353,766,000	334,990,000	332,804,000
Net International Imports	111,642,000	102,606,000	109,997,000
Total Purchased Power	465,408,000	437,596,000	442,801,000
Total Input	**10,457,309,000**	**9,507,098,000**	**10,381,711,000**
	DISPOSAL OF ENERGY		
Total Sales to Ultimate Customers	**8,805,671,000**	**8,323,923,000**	**8,398,122,000**
Company Use, Etc.			
Used in Electric Railway Department	34,232,000	31,039,000	32,400,000
Used in Electric and Other Departments	170,677,000	157,622,000	156,419,000
Furnished Free or Exchanged in Kind	5,514,000	5,345,000	4,305,000
Total Company Use, Etc.	210,423,000	194,006,000	193,124,000
Total Energy Accounted For	**9,016,094,000**	**8,517,929,000**	**8,591,246,000**
Losses and Unaccounted For	1,441,215,000	989,169,000	1,790,465,000
Total Output (To Check Above **"Input"**)	**10,457,309,000**	**9,507,098,000**	**10,381,711,000**
	CLASSIFICATION OF KILOWATTHOUR SALES		
Residential or Domestic	1,986,834,000	1,814,804,000	1,719,408,000
Rural (Distinct Rural Rates Only)	.....	.....	.....
Commercial and Industrial			
Small Light and Power (Retail)	1,706,170,000	1,630,964,000	1,568,452,000
Large Light and Power (Wholesale)	4,143,377,000	3,983,709,000	4,183,019,000
Public Street and Highway Lighting	192,238,000	165,938,000	159,132,000
Other Public Authorities	203,289,000	193,959,000	202,361,000
Street and Interurban Railways	372,726,000	345,016,000	357,899,000
Electrified Steam Railroads	158,548,000	147,567,000	166,543,000
Interdepartmental	42,489,000	41,966,000	41,308,000
Sales to Ultimate Customers	**8,805,671,000**	**8,323,923,000**	**8,398,122,000**
	ESTIMATED REVENUE		
Revenue from Ultimate Customers	$199,182,600	$188,405,300	$184,664,800
Other Electric Revenue	2,147,100	1,813,300	2,048,900
Total Revenue	$201,329,700	$190,218,600	$186,713,700
	RESIDENTIAL OR DOMESTIC ELECTRIC SERVICE—12 MONTHS ENDED		
	(January 31st)	**(February 28th)**	**(March 31st)**
Kilowatthours per Customer	859	863	867
Average Annual Bill	$36.16	$36.25	$36.24
Revenue per Kilowatthour	4.21¢	4.20¢	4.18¢

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EDISON ELECTRIC INSTITUTE BULLETIN

Volume 7 JULY, 1939 No. 8

New E. E. I. Wiring Booklets Offer Direct and Practical Approach to Adequate Wiring

THE Edison Electric Institute, through its Wiring Committee, makes a direct and practical approach towards the solution of the adequate wiring problem with the publication this month of a series of three booklets designed to clarify some of the muddied, though essentially simple, aspects of adequate wiring and to stimulate its aggressive promotion.

These booklets based on the background of years of extensive research by highly qualified technicians, numerous discussions, and cooperative studies of many of the groups interested in better wiring are: The Basic Factors of Adequate Wiring; Covered Neutral Cable Helps Sell Adequate Home Wiring; and Commercial Building Rewiring Market. They visualize with text and illustrations the adequate wiring objectives and the means of obtaining them. The technical aspects are presented in a form to encourage assimilation by the varied groups to whom they are directed, including architects, builders and property owners, as well as the several branches of the electrical industry engaged in supplying, installing and promoting electric wiring.

The introductory booklet, Basic Factors of Adequate Wiring, treats the subject of interior wiring as a whole, discussing the factors that must be recognized in any program for improvement of the present wiring conditions and stresses the immediate need for (a) establishment of *direct sales promotion* of safe, economical and adequate wiring (b) the promotion of *new* and *improved wiring methods* and *materials* (c) broader wiring education *within the industry.*

The other two booklets are specific in character. The second of the series, Covered Neutral Cable, supplies a record of experience with simplified wiring as applied to residences, together with recommendations for adequate wiring specifications. The third, Commercial Building Rewiring Market, explains the intended application of new types of small diameter wires, bare neutral wiring in conduits and electrical tubing, and recircuiting which will result in more efficient use of metal conduits. This booklet is directed entirely towards the economic rewiring of existing buildings.

The series of booklets is being distributed to electric utility executives, members of the I.A.E.I. and to the headquarters of electrical leagues and other interested organizations, but the main distribution must necessarily be made by the local utility companies to the inspectors, contractors, builders, architects, and others in their territory concerned with better wiring, as well as to members of their staffs dealing with wiring matters.

Limited copper capacities in the wiring of structures of various classes for a long time have been the bugbear of the consumer as well as the electrical industry. As new appliances and better lighting have been accepted by the public, inadequacy in wiring, and the cost of correcting it, has become a major load-building problem for the electric utilities. The Wiring Committee booklets point the way out of the morass of difficulties that have in the past hampered the wider use of electricity. The work of the engineers and the manufacturers in developing new materials and new methods are ready for use. Circuit capacities in existing conduits can be doubled and tripled through these materials and methods at comparatively little expense. Building owners can be approached with

I am convinced that we all stand to profit by the prompt adoption of modern wiring methods. We all compose a chain and each link of that chain will be strengthened in its own right, from the manufacturer to the jobber, to the contractor, to labor, through the utility to the public, with the cooperation of the inspectors. With absolute regard to safety of life and property, the industry can, if it will, offer to the public wiring methods at cost which are better within their reach.

We sometimes lose sight of the fact that when costs are too high, one of two things usually happens —either the public refuse to buy at all or they buy competitively. If we, who make up the electrical industry in all its parts, keep our costs too high—whether they are for material, for labor, or for kilowatthours—we put a burden upon our customers, the public, and they either go without our service or substitute something else for it. The end result is that we all lose.

When we all really understand that our own self-interests will be served, we shall get the intelligent cooperation which will bring these benefits to the public. It is one for all and all for one!—EDWARD T. GUSHEE, *Vice-President, The Detroit Edison Company.*

These three booklets offer a Direct and Practical Approach to the Solution of the Adequate Wiring Problem

definite proposals for rewiring and relighting at a unit cost that will open new markets to the benefit of the entire industry.

Some of the new developments presented in these booklets already have the sanction of the National Electrical Code. Some have not yet been approved by the Code, but all have been presented for inclusion in the 1940 edition. In the meantime, they can be used by local permission of the inspection authorities and should be so used. All of the materials and methods are safe and technically sound.

Small diameter building wire, the use of bare neutral in iron and steel raceways, recircuiting of existing conductors are among the developments discussed in the booklet Commercial Building Rewiring Market. These developments make possible the economic increase in wiring capacities in existing buildings, both for the supply of increasing demands and for relieving badly overloaded circuits.

Overloaded circuits and make-shift extensions have been the major source of difficulties in interior wiring systems. Adequate wiring, i.e., ample capacity and ample outlets, installed by competent workmen, using good material under proper supervision will eliminate these difficulties and add greatly not only to the convenience of the use of electricity but to safety.

The dominating thought in the series of booklets is the benefit to be derived both by consumers and by the entire electrical industry from active promotion of adequate and economical wiring.

Consumers will benefit through more outlets at a lower cost per outlet with equal or greater safety.

Electrical manufacturers will benefit despite reduced unit costs. Lower unit costs encourage fully adequate installations which will not cost less, but will provide more for a given cost. New low cost materials will open markets. The sale of a larger number of units will materially increase the gross business that manufacturers will enjoy.

Electrical wholesalers will profit for the same reasons that manufacturers will profit. Both wholesalers and manufacturers will also benefit from increased sales of lighting and electric appliances whose markets will be expanded through adequate wiring.

Electrical contractors and journeymen will benefit from the increased business resulting from a larger use of simplified materials. Experience in localities where these materials have been employed prove conclusively that this is the case.

The endorsements quoted here are typical reactions of contractors who have had first-hand experience with Covered Neutral Cable assemblies:

"The use of Covered Neutral Cables in house wiring has enabled me to make more money on every house wired, after I gained some experience with it."

"Covered Neutral Cable is easier to handle and makes a better looking job."

"From a safety standpoint it is as safe as any type of residential wiring and it provides a more adequate job for practically the same cost."

"It is very easy to do fish-work with Covered Neutral Cable."

"It has allowed me to make more money on house wiring and has given me another talking point in selling wiring to the customer. This point is that it allows the customer to do away with the necessity for long extension cords."

Electrical inspectors realize that more adequate wiring reduces circuit overloading as well as the use of sub-standard materials which are not safe. The inspector's responsibilities will be simplified when the public can be provided with an adequate wiring installation at a price which it is willing to pay. The City Electrician of Omaha advises that:

"The Inspection Department of the City of Omaha has granted permission of a local industry group engaged in the promotion of more adequate wiring in new residences to employ type CNX covered neutral cable assemblies as a wiring method. At this writing 61 houses have been so wired.

"As a result of this cooperative endeavor, these new houses have an average of 55.5 outlets as compared to 35.5 outlets under previous practices. In addition to providing a safer installation, due to the fact that a sufficient number of outlets are now being installed which eliminates the necessity for people to use so much lamp cord, we are of the opinion that general conditions are very much improved. No case of fault has been found in the use of this type of material and the contractors are well satisfied with the increased business which they now enjoy.

"I am perfectly willing to go on record, as I am thoroughly in accord with the results obtained from this cooperative effort in Omaha."

The Chief Electrical Inspector of Detroit has advised the Wiring Committee of a series of tests on residences wired with Covered Neutral Cable, in service for about two years. He states:

"About fifty branch circuits in several different residences were checked with the megger and in all cases, the megger readings were infinity. Although the original intent was to test four or five hundred circuits, the results obtained on the first fifty circuits allowed this Inspection Department to arrive at the definite conclusion that this type of material compares favorably with other types used in residential wiring."

The prime objective of the electric utility is not a reduction of the overall amount expended on wiring but the development of materials and methods which will bring safe and adequate wiring within the economic reach of more of its customers so that greater use and benefits of its product can be obtained.

A positive course of action by all electric utilities in the furtherance of the new methods and materials discussed in the booklets is advocated by the Wiring Committee. In brief, utilities are urged to:

(1) *Establish direct sales promotion of safe, economical and adequate wiring among customers.* This is now being done in some localities with beneficial results. The inadequate wiring encountered in residences both new and old, offers an excellent opportunity for initial projects. Less expensive wiring methods for ranges, water heaters, and air-conditioning equipment are other possibilities for immediate consideration. Rewiring of commercal buildings for greater electrical usage is a serious and pressing problem in all parts of the country.

Customers should be made more conscious of present wiring inadequacies and repetition of past errors should be discouraged. This is not a job that can be undertaken like a 60-day sales campaign. It calls for a continuing program of customer education. National industry movements should be supported and local cooperative programs set up.

(2) *Promote new wiring methods and materials.* They should be promoted because they are safe and reliable, because they help solve wiring problems and bring down unit wiring costs, thus encouraging wiring adequacy and increasing the amount of wiring and wiring work. They are in the interest of the customer and the electrical industry.

Local cooperative 'trails' under proper supervision will expedite recognition in the National Electrical Code. It is desirable that a larger number of local companies adopt this policy so that modern wiring practice may keep abreast of increasing electrical use.

(3) *Undertake wiring education with the industry on a much increased scale.* Promotion of new wiring ideas and wiring adequacy is largely an educational problem. There need to be many discussions among contractors, journeymen, wholesalers, inspectors, manufacturers and utilities. Information such as that contained in the Wiring Committee booklets should be passed along to local industry groups. It is highly desirable that each operating utility have a technical adviser, well versed in modern wiring practice, available for discussions with local industry groups.

(A full discussion of all of the proposals made by the utility group for inclusion in the 1940 National Electrical Code including detailed tests on the use of uninsulated neutral conductors in rigid conduit and electrical metallic tubing is available in the booklet "Discussion of the Revisions of the National Electrical Code Proposed by the Electric Light and Power Group." This may be obtained from the Edison Electric Institute, as well as copies of the booklets discussed in this article.)

Some pages from Basic Factors of Adequate Wiring

The Electrification of Industry and Its Contribution to Economic and Social Progress

By E. O. Shreve

Vice-President, General Electric Company, Schenectady, N. Y.

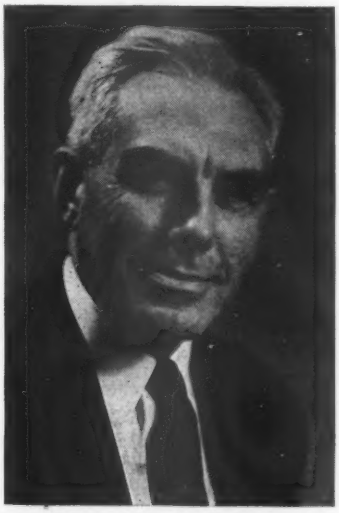
An address before the Pacific Coast Electrical Association, Inc., Los Angeles, May, 1939

EVERYONE recognizes the three major responsibilities of business —which are, to its employees, to its customers and to its stockholders. I will dwell more on the second—the responsibility to its customers.

In general I shall indicate how certain businesses are meeting their responsibilities to customers, but specifically I will try to show how great an influence electricity is having on employment and working conditions, the standard of living and the general welfare of the American people. As an example, let us consider the child of today. He finds it difficult to understand why his great-grandparents did not have an automobile, an electric refrigerator, a radio and many other devices which we take for granted and are thought of as pleasant and comfortable necessities of life—things which either did not exist or were expensive luxuries forty years ago.

He does not realize that only a few were able to afford automobiles and telephones in 1900, while today in the United States we drive to work in twenty-five million automobiles, we talk to our friends over eighteen million telephones, and we take baths in twenty million bathtubs and have the advantage of numerous other things which were classified as luxuries, or else merely dreamed of, in 1900.

Tremendous progress has been made toward increasing the standard of living in this country and every industry has contributed to this progress. Yet, as we analyze the advance that has been made, we see that in practically every instance electricity and electrical developments have played an outstanding part. Its part, has made possible increased quality of product with greatly reduced cost, creating opportunity for wider markets and greater employment in many industries. In the comparatively short time



MR. SHREVE

that I have I cannot do justice to the story that might be told, but let us look at a few of our major industries and see some of the ways in which electricity and electrical developments have done their great work.

Aluminum

Consider the aluminum industry—it was not so many years ago that aluminum cost $8.00 a pound. Very few people were able to afford aluminum pots and pans. But a new refining process using electricity reduced the cost of aluminum to twenty cents a pound and opened up a very wide market for aluminum products. The average yearly kwhr consumption over the last three years in this industry is approximately 1 billion 500 million.

This electrolytic method not only brought many additional benefits into the household but also increased the number of people employed by the aluminum companies from only a few hundred at the time of its advent to around twenty-five thousand men at present.

Steel

One of the basic and most important industries is the steel industry, so let us review the part that electricity has played in its development.

Prior to 1906 electricity was used very little in the steel mill. An average steel mill at that time was relatively small—the reciprocating engine was the generally accepted drive. The rolling mills were hand controlled and there was very little flexibility in operation. The finished steel produced at that time with few exceptions was only six or seven feet long and the steel manufacturers were unable to produce the many varieties of steel for which there was an apparent demand.

The application and designing engineers of electrical equipment manufacturing companies, working very closely with the steel companies, began to solve some of their problems by the proper application of electrical equipment.

The use of electric motors and control soon gave the steel industry the much needed flexibility in manufacture and electrical equipment began making possible the operation of continuous hot-strip mills on an economical basis.

Improvements continued and today the application of electric drive and control to the hot-strip mill has made it possible to roll steel 96 inches wide at speeds up to 2000 feet per minute. It would be impossible to carry on this operation with any other but electric power.

Remove the electrical equipment, and no up-to-date steel mill could operate.

The tremendous part that electricity has played in the production of steel is brought out still more clearly in the case

of the cold-strip mill which is used to still further reduce the thickness of the steel strip. Such a mill requires very close control of operation, because the strip must be held at constant tension and any great variation would make this operation impracticable. Again, this problem was met by the application of electrical equipment. The rolling proceeds at speeds of 1800 feet per minute and the sheet must be rolled to a gauge within close tolerances. Therefore, it is necessary that the gauge be measured continuously while the metal is passing. This problem was solved by an electric micrometer which has been developed for this particular operation.

It would be impossible to operate a cold mill without electric drive. Derived of electricity, the cold-strip mill which reduces by many dollars the cost of steel would soon disappear, together with its big brother, the hot-strip mill. Here, it is not a question of doing a better job with the help of electrical equipment, but it is the problem of doing it electrically or not at all.

The process just described has greatly increased the use of flat products such as sheet and tin plate.

Electric heat also has found an important place in the steel industry in the melting, refining and heat treatment processes. It has the advantage of giving precision control, cleanliness, and freedom from spoiled products. It has been applied with great success in the production of better grades of steel, particularly alloy steels.

The steel companies certainly are to be complimented in the great advance which they have made in bringing out new kinds of steel and reducing costs through the use of electricity and electrical equipment. Their efforts, combined with the contribution of the electrical industry, have made it possible to so broaden the market for steel products that today the steel companies employ approximately 500,000 persons, compared to 275,000 in 1907. The average man hours required to manufacture a gross ton of finished steel product in 1904 was at least 117; now it is about 36. The normal annual kilowatthours used in the steel industry is from nine to ten billion. Roughly, it requires 200 kwhr to produce a ton of steel. The price of steel has been reduced by 46 per cent since as recently as 1923. This price reduction, coupled with the new products which they have been producing, has had an enormous effect on other industries in the way of quality of product, cost and employment.

Automotive Industry

It has had its effect in another important industry, the automotive industry. I believe everyone will agree that the reduction in the cost of steel and improvement in its quality, together with the electrification of the automotive industry, has had a far-reaching effect in producing the high quality automobiles that we can purchase today as compared with the cars which could be purchased for the same amount of money in 1923. Also, it will be interesting to note the number of passenger car owners has increased from 13,480,000 in 1923 to slightly over 25,000,000 in 1938. The number of wage earners associated directly with the automobile industry, including automobile factory workers, tire and accessory factory workers, truck drivers, taxi drivers, gas station attendants, etc., has increased from approximately 3,000,000 in 1923 to approximately 5,700,000 in 1938. In addition to the great increase in quality the cost for comparable passenger cars has decreased at least 30 per cent between 1925 and 1938—undoubtedly electricity has been the chief contributing factor in making this advance possible.

Again, although in 1925 it required 230 man hours to produce a car as against only about 195 now, as has been indicated, the total employment increased materially. In 1923 it required about 125 kwhr to build an ordinary car; now for a comparative car 400 kwhr are used.

I could continue to expand almost indefinitely on the many benefits that have come to the American public because of the electrification of the steel industry alone by citing its effect on the canning industry and several others, but time will not permit, so let's take a look at the petroleum industry.

Petroleum Industry

In this industry again electricity is deserving of considerable credit in the development of one of the largest and most important segments of our economy. The growth of the American petroleum industry has been very rapid, and although this industry always has had a high degree of mechanization, the advent of modern electric equipment has undoubtedly contributed a great deal to its present stage of efficiency.

In few industrial fields have applied science and engineering methods been so aggressively developed and utilized, and the progressive use of electricity in the oil industry is outstanding, particularly in the art of refining.

Direct acting steam pumps were originally used for pumping condensing water, crude oil, and other products of refining. This was done largely to eliminate the fire hazards, and since large amounts of steam were necessary for the distillation processes, the steam required for pumping was considered on an incremental basis and was apparently economical.

The first application of electric power in the oil refineries was for lighting which was used to avoid fire hazards caused by open flame torches or gas lighting. However, with the advent of the induction motor and centrifugal pump, electric power began coming into use for water pumping since large quantities of water were required and the pumping stations and supply ponds could be located at some distance from the stills and other refining operations where the elimination of fire hazards was important. Later the explosion-proof motor came into being and again widened the field of potential use of motors to produce safety conditions. Today, oil refineries perform approximately one-half of their operations with electric motors.

It is interesting to note that of the total of approximately one billion, one hundred seventy thousand kilowatt hours of electric power used annually approximately two-thirds is purchased power and one-third generated privately.

Recent developments in the refining industry indicate that further use of modern electrical control devices will be found very profitable and will contribute to further advancement in the refining art.

Just as electricity has contributed to the steel industry in making it possible for the average man to own an automobile, so has electricity contributed to the oil industry in making it possible for the people to run their automobiles at the lowest possible cost for power fuel, or gasoline. The average retail price of gasoline, excluding sales taxes, in 50 respective cities has declined in the past fifteen years, during which period a progressive use of electricity has been made, from 21.06 cents per gallon in 1923 to 14.07 cents per gallon in 1938.

In 1923 the refineries produced 181 million barrels (42 gallons each) of gasoline. In 1937 they produced 559 million barrels of gasoline. The number of employees increased from 67,000 in 1923 to 83,000 in 1937, so again, you can see that electricity and the applica-

tion of electrical equipment is contributing substantially to the American public, both in economic and social welfare.

Textile Industry

Let us next review the textile industry. Here we have one of the oldest industries in the world. In the United States, it was started with the landing of the first settlers.

The early mills were built near rivers where water power could be easily developed. The danger of locating many of the mills close to the water power source was soon recognized by the damage done by the Spring freshet which frequently put the mills out of operation for a considerable length of time. In addition, the type of drive used was very inflexible and unless the mills were operating at full capacity, the power losses were high. Failures of the prime mover or the main shaft drives meant complete suspension of production until repairs could be made.

Very little could be done to overcome these obstacles until the advent of electricity and electrical equipment. In 1893, the Columbia Mills in Columbia, S. C., took the first radical steps to overcome the existing conditions, and installed the first electric motors to drive textile machinery. The power plant was located some 700 feet away from the mill. The mill was built on high ground, out of range of flood area and close to the railroad which facilitated the shipment of raw material and finished products.

Constant improvement in textile machinery, in electrical equipment and new application of electrical drive and control, have made it possible for the textile manufacturer to produce higher quality cloth at lower cost.

A study of statistics shows that from 1910 to 1936, the possible production per man-hour for carded broadcloth was increased 49 per cent. For sheeting it was increased 55 per cent. For print cloth, 51 per cent, and terry cloth, 151 per cent. It is difficult to obtain figures showing comparative costs of finished textile products, nevertheless, we know that today the average person is able to purchase a much better garment for the same money that was paid in 1910.

The Rayon Industry which started in this country about 1910 has shown one of the greatest advancements and expansions of any of the industries in the United States.

During the first ten years of this industry, it produced an average of 8,700,000 pounds per year. In 1938, its production was 327,000,000 pounds. This increase must be attributed in a large measure to the efforts of electrical manufacturers in being able to produce motors and control for the manufacture of this synthetic fibre. It would be impossible to operate a rayon plant with the old method of mechanical drive or group drive because of the high and accurate speeds which must be employed.

The knitting and hosiery industry would be in a bad plight today if it lost the adjustable speed motor with automatic control. We must also remember that it was only a few years ago that silk stockings were considered a luxury—a condition which does not exist today.

It goes without saying that the modern methods of manufacture made possible by the use of electrical equipment in the textile industry have helped improve working conditions such as safety and health in the mills.

The December 1938 United States Department of Labor report indicates a considerable fluctuation in employment in those manufacturing industries which come under the title "Textiles and Their Products." In most cases, however, for every group under this classification, an increase in 1937 over the figure for 1924 is shown. This is particularly true of those industries which utilize the products of the textile industry, such as men's clothing, women's clothing, shirt and collar manufacturing, etc. The net result of this continual seeking for new developments, modernizing of equipment, etc., which is accompanied only by the cooperation of the textile mills, the power companies, and the electrical manufacturers working together, is to promise even greater strides and progress for the coming years, which would result in even more employment, higher wages, and lower costs of products with the resultant greater distribution of products among all classes of people in the country.

The Paper Industry

Now let us see what part electricity has played in the paper industry.

It was not long ago that "paper" meant nothing more than our daily newspaper or the material used by the butcher to wrap our meat in, but witness the changes wrought by a few years. Today, the average American citizen makes use of paper in many forms. His house is partially built with it. His electrical appliances are quite likely insulated with it. His cigarettes are wrapped in paper, his breakfast food is wrapped in two kinds of paper to protect it from moisture, and everything he eats comes wrapped in paper in one form or another.

Our letters and all our correspondence are printed on paper and our money is made of it. In fact, this amazing product is so flexible that the average individual has difficulty in distinguishing paper products from other materials. Bags, brief cases, wallets, covers, and many articles which appear to be beautifully grained leather, are paper—even shoes and collars are not exempt. Paper and its derivatives are accepted without thought, like the air we breathe—and add immeasurably to our health, our comfort, and to our high standard of living.

The use of paper in the United States has increased from 69 pounds per capita fifty years ago to 200 pounds per capita today. This increase can be largely attributed to the alert and progressive efforts of the paper industry working in cooperation with the electrical industry to electrically modernize plants, speed up production, and make a better grade and more varieties of paper at a greatly lowered cost.

For example, in 1920 paper machine speeds were 600 to 700 feet per minute. One machine has recently reached the unheard of speed of 2000 feet per minute, made possible by accurate speed control obtained through the application of electric power. Most machines in the industry have been speeded up, demanding greater horsepower; synchronous motors have replaced steam engines and induction motors on beaters, Jordans and pumps; the motor has replaced the waterwheel for grinders and has increased in size from 600 hp. to 4000 hp. with little consideration being given to anything but the synchronous motor.

Process steam is used in large quantities in the paper mill and in the interest of economy and a steam-power balance, turbines have practically replaced steam engines and water-wheels, most of these being of the single or double extraction, condensing type with a governor developed purposely to meet the varying demands of steam and power, and maintain constant frequency.

With the enormous amounts of money that have been spent during the past twenty years in this billion dollar industry, the number of wage earners has remained fairly constant but wages per man have increased. During this time total production has increased 75 per cent. However, this increased production, resulting in lower paper costs, has increased the employment in those industries which use paper as their raw material. These industries, such as box

and paper product manufacturing, printing, publishing, etc., while fluctuating considerably, have shown a steady increase in employment from 1924 to 1937 of about 10 per cent. The annual power consumption in 1920 was approximately 2 billion kilowatthours; 1929, 7 billion, 200 million, and in 1938, upward of 9 billion kilowatthours with about 40 per cent purchased power.

Farming

Electricity has made real contributions to the farming industry—an industry which gives employment to over 8,000,000 men and women, and which has a combined annual production of about ten billion dollars.

Ever since 1898, when one of your Pacific Coast companies built a line to operate irrigation pumps on farms, electric service has been gradually extended to the farmer. Today, it is contributing to a better standard of living on one and one-half million farms. At the same time, it has made it possible for the farmer to operate more economically and to give a better quality product to the public at no greater cost.

As an example, look at the modern dairy farm. Electric grinding and mixing of feed makes possible balanced diet feeding of blended feed for maximum output. Electrically pumped water under pressure available for frequent use by cows accelerates conversion of feeds into milk, thus increasing production. Electric ventilation, lighting, and water make for a healthful sanitary condition in the barn. The cost of milking is halved, production protected, and cleaner milk produced by electric milking machines. Electric water heaters and dairy utensil sterilizers fight bacteria count in milk production. The electric milk cooler preserves the high quality of milk at a lower cost than by any other system. Milk is now also pasteurized electrically.

Using electricity properly, a dairyman can easily double his herd size as well as production and also improve quality with no increased labor cost.

A farmer in the Middle-West with a small dairy herd and one hundred and twenty acres of land kept accurate records on seven farming operations before and after electrification. His records showed that he saved $363 per year—and bear in mind, he included interest on his investment and depreciation charges on his equipment, as well as cost of power. Little wonder dairymen have stated: "I wouldn't operate a dairy farm without electricity. It makes for success on a farm when it is used the right way." Of course the public also benefits because it is getting a better, more uniform quality of milk at no greater cost.

Time does not permit to go into detail on the vast effect that electricity has had toward improving the other phases of the farming industry, so I will mention only a few.

The use of electricity, particularly during the winter months, has made possible a more uniform production of eggs throughout the year. Thus, there are not the extremes in egg prices today—fresh eggs are available the year around at reasonable prices. In addition, a poultryman using electric lights on one thousand laying birds can increase his net profits over $250 per year.

The truck gardener and nurseryman reduces the likelihood of losing his crop and produces superior plants by sterilizing bed soil electrically to eliminate plant enemies such as weeds, diseases, and insects.

Electric soil-heating in benches and beds makes possible the sale of more vegetables and flowers out of the normal season.

I have not mentioned the most important job electricity does on farms in this section—irrigation. You are familiar with the many electric pumping installations where crops cannot be grown well in those sections without irrigation. In other sections irrigation pumps are operated to supplement natural precipitation. That practice is spreading to practically every farming state on fruits, vegetables, and many field crops. Some crops could be harvested without irrigation, but by applying even a few inches of additional water at just the right time, the larger yield or better product for that year, or the protection often afforded for the next year's crops, makes the practice profitable.

Consideration must also be given to the fact that water under pressure has saved many farm buildings from fire.

When I started this discussion, I did not mention that the electrical industry has listed over 200 uses for electricity on farms. I am always amazed at the amount of constructive effort our industry has for years put behind farm electrification. Many difficult obstacles have presented themselves. However, we can see the results of the work which has been done toward benefiting the farmer and the American public.

Central Station

Of course behind these accomplishments has been low cost electric power, so we must not overlook the excellent work that has been done by the Central Station Industry. Here again, the engineers of the electric manufacturing companies, working hand-in-hand with the Central Station engineers, have brought to the Central Station Industry many new developments which have benefited the public. For instance, the improvement in the steam turbine, along with some improvements in boiler efficiency, have made it possible for the average steam station to produce one kilowatthour for 1.42 pounds of coal today as compared to one kilowatthour for 3.2 pounds of coal in 1919. Other developments such as improvement in transformer efficiency, high speed switching, which makes it possible to transmit power long distances, unit sub-stations, the spira-core transformers, feeder voltage regulating equipment, and numerous others have aided the Central Station companies toward reducing the average power rate for residential use from a figure of 25 cents per kilowatthour in 1882 to an average cost of 8.7 cents per kilowatthour in 1913 and finally to an average cost of 4.2 cents per kilowatthour in 1938. The kilowatthour consumption per residence per year in 1938 was 850 kilowatthours compared to 260 kilowatthours per residence in 1913. Stating this another way, the average residence today, uses three times as much power compared to 1913 at an increase of total cost of only 35 per cent, to enjoy the many benefits which come from the use of electricity, because in 1913 there were only approximately 3 million, 500 thousand residential users of electricity compared to 22,000,000 in 1938.

The industrial, commercial, and all other users have also increased from 336,600 in 1913 to 5,750,000 customers in 1938.

This expansion of the electrical market has made it possible for the Central Station Industry to increase its number of employees from 79,000 in 1913 to 270,000 employees in 1938, an increase in employment of 341 per cent.

Before we leave the Central Station Industry let me call to your attention that the residential kilowatthour output today totals per year 18 billion, 600 million, compared to only about one billion in 1913. Is it not reasonable to expect that this will be 50 billion kilowatthours 10 years from now, as several of our good friends in the Central Station Industry are predicting? Just think what a tremendous effect this would have on the improvement of our standard of living!

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McGraw Prize Paper

Increased Loading of Apparatus and Lines Permits Practical Economies

By A. H. Kidder and F. R. Ford

MR. KIDDER

This paper, which won the First James H. McGraw Award for 1939, was written jointly by Messrs. A. H. Kidder and F. R. Ford of the Philadelphia Electric Company.

Upon graduation from the Drexel Institute of Technology in Electrical Engineering, Mr. Ford entered the employ of the Philadelphia Electric Company in 1916 as a cadet engineer. After a subsequent period of service in the Army he assumed the position of Design Calculator in the Station Engineering Division, becoming Assistant Chief Electrical Designer in 1926. In 1931 he was promoted to the position of Assistant Engineer of Inside Plant, Electrical Engineering Division, which position he has held since. He is a member of several technical committees relating to electric station and substation design, and the author of a number of articles on allied subjects.

Mr. Kidder was graduated with the degrees of S.B. and S.M. in Electrical Engineering from the Massachusetts Institute of Technology. He entered the Philadelphia Electric Company in 1923 as a designer in transmission and distribution work. Through successive promotions he became Assistant Engineer of System Planning, Transmission and Distribution, Electrical Engineering Division, the position he has held since 1932. He is a member of technical committees, being assistant secretary of the Transmission and Distribution Committee of the Edison Electric Institute for two years, and the author of a number of articles relating to his work.

MR. FORD

THE attainment of the lowest practicable investment costs requires that each load carrying unit in the supply system have as large a load as it may carry without any compromise in the present high standards of voltage regulation and service continuity. The basic importance of maintaining continuous power supply, coupled with the need of providing capacity for load growth, often requires load carrying units in the supply system to operate under conditions such that the sum of the normal maximum demands on these units is less than 60 per cent of the sum of their name-plate ratings. Most of the resulting "idle capacity" is held in reserve to permit the supply of continuous service; that is, held available for use when one or more units fails or is taken unexpectedly out of service. A large proportion of "idle capacity" may be unavoidable under certain circumstances. However, we have thought to question the practical engineering need for so high a ratio of name-plate rating to load as accompanies installations made to meet the emergency loading requirements in the conventional way.

This paper attempts to outline the results of the investigations conducted by Philadelphia Electric Company in the light of the foregoing situation during the past ten years. The results accomplished to date relate principally to determining load ratings for substation supply lines, transformers, voltage regulators, distribution circuits and transformers; or that large group of facilities which constitute the distribution system. Except for aerial distribution transformers, there has been little or no thought of allowing the maximum demands to reach values which exceed name-plate rating under normal conditions in an average year. A guiding principle throughout all of these investigations has been that the maximum emergency loads to be carried shall not be sufficiently severe, with due regard to their probable magnitudes and frequency of occurrence, to cause an appreciable reduction in the average life expectancy of the facilities required to carry such loads. In our opinion, the age of the equipment is generally of little importance in establishing load ratings.

Nearly all of the additions to distribution plant investment are made to provide for the supply of load growth and to maintain, or improve, service continuity. Perhaps it would be helpful to illustrate the importance of these two factors by discussing their effect upon substation transformer bank loading. Let us say that the load on a substation in one year is just equal to the normal load capacity of two transformer banks. A third or spare bank is provided in order

to have two banks available to supply the load, should one fail. In the following year, however, a small increment of load growth requires the installation of an additional transformer bank and in that year the four banks are needed to carry but little more than a two-bank load. In the course of a few years, load growth will gradually absorb the spare capacity until a time is reached when the load on the substation will very nearly equal the capacity of three banks. During the interval between the installation of the fourth bank and the time when its entire capacity would be required for adequate reserve, then, there has been an average excess transformer capacity above load that is about equal to one and one-half transformer banks. Stated in more general terms, this amounts to saying that each substation which has (n) identical banks of transformers in service and a growing load will have an average of 1.5 banks of excess capacity, and the ratio (r) of the installed capacity to the average yearly maximum demand on the substation is:

$$r = \frac{n}{n - 1.5}$$

This ratio holds for any group of three or more identical lines, transformers, circuits, etc., so long as the number does not become large enough to justify consideration of coincident emergency loss of more than one unit in the group. In Philadelphia Electric Company, no substations are supplied by more than seven lines or have more than four transformer banks. While it is true that the number of primary distribution circuits is large, it is seldom that the load of one circuit can be transferred readily to more than four adjacent circuits if it should fail ($n = 5$) and, similarly, there is seldom opportunity to transfer the load of one distribution transformer to more than two adjacent transformers ($n = 3$). Few of the suburban substations have more than two transformer banks ($n = 2$). Hence, in each part of the distribution system, we find we are dealing with groups of units in which the values of (n) range from 2 to about 7. By substituting such values in the foregoing equation we may find directly that the resulting ratio of emergency load rating to the average yearly maximum demand per unit ranges from 4 to 1.27 for each such group. That is, that the service continuity and load growth considerations require providing from 300 per cent to 27 per cent of capacity in excess of that which would be required if these two factors were not inextricably present in a growing electricity supply system.

Number of Units Normally in Service	Ratio of Emergency Load Rating to Average Yearly Maximum Demand per Unit
2	2 to 4.0 (formula not entirely satisfactory for this case)
3	2.0
4	1.60
5	1.43
6	1.33
7	1.27

Once the full significance of these factors is appreciated, it is a simple matter to explain the wide margin between capacity installed and the sum of the normal non-coincident maximum demands in each part of the supply system. For instance, there may be many substation supply cables in a given underground transmission duct bank but, if the average number of supply cables per substation is five, the sum of the normal non-coincident maximum demands on all the supply cables in that duct bank will amount to a total of but 70 per cent (100%/1.43) of the combined emergency load capacities of those same cables. The same general relationship operates inexorably for each other class of load carrying equipment in the distribution system and, to some lesser extent, in the bulk power system.

Unless special care is taken, therefore, this characteristic of supply system design may be responsible for a considerable excess of investment. Its presence cannot be avoided. However, the effect upon investment in load carrying facilities can be controlled to a large extent, by judicious application of emergency load ratings that are somewhat higher than the load ratings which would represent sound engineering practice for regular daily operation. The foregoing table is helpful also in illustrating the ratio of emergency to name-plate ratings which would be required in order to bring the average yearly maximum demand up to a value equal to the installed name-plate rating of each group of two or more units normally in service. Ratios as high as 1.6 and 2.0 would represent hopeless requirements, however, if emergency loads and their effects upon operating temperatures did not differ materially from normal load conditions.

Emergency operations differ from normal conditions chiefly in two respects:

1. Emergency loads are transient in nature and, usually, short-lived.
2. The probability is usually very remote that an emergency will occur at the time when loads, ambients and the limitations of installed capacity would combine to require operation of the equipment at the highest possible temperature which is selected as the design limit.

For both normal and emergency conditions, nearly all loads are variable in their nature rather than constant. Hence, the maximum temperature reached lasts for a very short time and is in most cases considerably lower than would obtain if the usually appreciable thermal capacity of the apparatus were not present to reduce the temperature changes that accompany changes in load.

The problem of increasing load ratings, therefore, reduces to consideration of such factors as the operating temperatures to be expected and their possible relative effect upon the life of the apparatus in question, as determined not only by the temperature-life characteristics of the apparatus, but also the probability of occurrence of transient loads sufficient in magnitude to require operation at above rated temperatures.

Research by the electrical manufacturers, to determine more accurately the limits of loading of their major apparatus, has now corroborated our own belief that much of the electricity supply system may be operated at emergency loads sufficiently high to permit a 16 per cent to 60 per cent increase above the usual average daily loads, without facing the likelihood of incurring any appreciable reduction in the normal life expectancy of the equipment affected, or excessive voltage regulation.

There is much still to be done, as will be seen. There has been as yet no general opportunity to gain important investment savings by above-rating operation of generators or frequency converters. By the use of forced air cooling, three 100,000 kv-a 220-66 kv transformer banks have been rerated to 130,000 kv-a (150,000 kv-a at low ambient temperature), without incurring the likelihood of life loss.

A Specific Example

An example of possible gains to be made through above-rating operation is represented by the case of a typical urban distribution substation which is designed for a maximum of four 7500 kv-a transformer banks with 12 incoming and eight outgoing 6000 kv-a 13.2 kv lines, and a 12,000 kv-a emergency tie line to another substation. The complete installation includes 31 2.4 kv two-phase, three-wire distribution circuits.

With the original basis of design the maximum distribution load which could be supplied was the output of three transformer banks at their name-plate rating,

or a total of 22,500 kv-a. The full capacity of one bank would be required as reserve in case of failure of one of the banks. The distribution circuits could be loaded to only about 70 per cent of their rating, in order to maintain a margin for diversity and for taking on extra load through failure of equipment on an associated circuit. The total rated capacity of the 31 200-ampere circuits, as was considered the probable ultimate in the original design, is approximately 32,000 kv-a and the actual load (at an average of 70 per cent loading per circuit) is about equal to the 22,500 kv-a of firm transformer capacity.

The capacity of these transformer banks has now been established at 9000 kv-a normal and 12,000 kv-a emergency each, which gives a firm load carrying capacity of 24,000 kv-a with a three bank installation and 36,000 kv-a with a four bank installation.

It has also been found possible to apply emergency ratings to the circuits in which the induction voltage regulators are the limiting factors, so that the 200 ampere circuits can carry 250 amperes for occasional emergency four-hour periods. The underground cable portions of these circuits generally can take about all the load that the regulators can supply. There has been a considerable number of 300 ampere circuits installed in the past few years, with a growing tendency toward this larger rating. The 300 ampere circuits can carry 375 amperes for occasional four-hour emergency periods. This amounts to emergency operation at 25 per cent above name-plate rating for periods of four hours. Furthermore, to provide additional flexibility for emergency cuts of load from a faulted circuit to adjacent circuits, preliminary consideration indicates that we should soon find it practical to operate many substation circuits at 150 per cent of name-plate rating for about two hours, to be followed by 125 per cent for two hours.

The emergency ratings already in effect permit individual circuits to be loaded up to their nominal ratings normally with a margin available to take a share of the load from a circuit which has failed. Through such increased normal loading on a considerable number of circuits in a substation, the total normal load can readily be made as large as the 36,000 kv-a total rerated transformer capacity. This is approximately 60 per cent more than the originally designed distribution capacity of 22,500 kv-a.

In keeping with the increase in emergency capacity of the substation transformer banks and distribution circuits, it has been found possible to make substantial increases in the ratings of the 13.2 kv lines. The various 6000 kv-a lines have generally been given a four-hour emergency rating of 7000 kv-a and it has further been determined that one-half hour loadings at least as high as 9000 kv-a are feasible, with the possibility of going to 12,000 kv-a for this short period under emergency conditions. The usual cable size in this service is 3 x 350,000 circular mils.

The increased ratings are in most cases based on the limitations of the major station apparatus. It is usually necessary to change some of the associated equipment for above-rating operation, such as the current transformers, external bar copper or cable leads, and in some cases the reactors, disconnecting switches or oil circuit breakers. It is also usually necessary to provide special ventilating facilities to assist in disposing of the additional heat generated by the heavier loads on the equipment.

In any case, even with the maximum equipment changes which may be necessary, the unit cost for the increased capacity is very small compared with the unit cost for the substation capacity as a whole. The cost of the complete substation on the original design basis is approximately $1,100,000, the total substation supply capacity being 33,500 kv-a in firm capacity in transformer banks for the supply of distribution circuits. Thus, the cost per kv-a for the combined service is $19.60. The cost of the increased substation capacity due to application of emergency ratings to the facilities on the new basis will not be more than $20,000 assuming that the complete installation had been made before the application of the emergency ratings. In new installations provision can be made for the emergency operation at virtually no increase in cost over that which would obtain with the original design basis.

With the emergency ratings applied to all of the substation facilities, the total capacity becomes 39,000 kv-a for the 13.2 kv load and 36,000 kv-a firm capacity of transformer banks and circuits. The effective increase in capacity amounts to 19,000 kv-a at a cost of $1.05 per kv-a.

Other Instances of Increased Ratings

A few phases of the program for increased load ratings, and the extent to which such ratings have been applied, will now be discussed in the order in which they occur to us.

1. Large 33/4 kv Transformer Banks

The transformers involved in this class are of 2500 and 5000 kv-a self-cooled rating and are used in suburban substations designed for two, three and four bank installations. Transformers which have been purchased for this service in the past have been given self-cooled emergency ratings of about 150 per cent name-plate, as based upon probable ambient temperatures and load cycles during the peak load season. The application of forced air cooling to self-cooled transformers of this class increases their name-plate rating by about 50 per cent, and the emergency rating by about 30 per cent, in the designs which have been purchasing.

Operation at a load equal to emergency rating is expected to involve about 1 per cent or 2 per cent of life loss for one such operation on the remotely possible occasion when the emergency load requirement should coincide with the emergency capacity design limit.

2. Small Single Bank Substation Transformers

There are a large number of 33/4 and 13/4 kv substations in this class, whose transformers have ratings of 150 to 1500 kv-a. Current practice permits loads during the peak season up to 110 per cent of rating, for banks of 1000 kv-a rating or greater, and up to 120 per cent for smaller banks. The transformers are self-cooled. It is probable that these loadings will be increased in the future in accordance with the results of more careful studies made upon their characteristics in conjunction with the load cycles involved, the probability of severe loads, and the ambient temperature conditions.

The aerial networks, such as in the Northeast and Bethayres areas, have been designed on the basis of loading the transformers to 200 per cent rating in the event of loss of one of the two supply sources. The emergency condition might last for several hours, depending upon the nature of the failure and the transformer hot spot may reach a value of approximately 175° C with an ambient temperature of 10° C for winter conditions. The life loss in such a case would be of the order of 3 per cent.

During the past year there were installed several unit substation equipments which were developed for this company and have a 1000 kv-a three-phase transformer as their basic element. These units are equipped with thermal relays to permit relatively heavy over-

loads for short periods, should system conditions make this desirable. Use of some of these equipments in supplying 4 kv networks will probably make the short time heavy load capacity of definite value.

3. *2.4 and 4 kv Distribution Transformers*

The general practice with this type of equipment is to permit normal loadings up to 165 per cent rating for winter conditions and up to 135 per cent rating in summer. These values are based on the standard 105° hot spot and do not involve increased life loss over that obtaining for rated conditions. These ratings, which permit emergency loads up to 235 per cent, have been in effect since November, 1934.

The previous practice of normally loading only up to about 115 per cent of transformer rating resulted in a ratio of circuit load to connected transformer capacity of about 70 per cent. The present practice results in a corresponding ratio of about 100 per cent.

The heavier loadings have resulted in some initial difficulty with increased voltage drop. This, however, is a matter of secondary circuit design which generally will correct itself as changes are made to provide capacity for load growth.

In the case of the three low voltage network areas in the central business district of Philadelphia, it has so far been considered desirable to limit the loading to 80 per cent of the transformer rating for normal operation and to 160 per cent for one-half hour emergency periods where one of the two supply sources might be lost. The transformers being located in vaults, the ambient temperature would be of the order of 25° C. This emergency loading is quite conservative, involving a transformer hot spot temperature of 105° C, and can no doubt be appreciably increased as the system load grows.

4. *33 kv Transmission Lines*

The No. 00 33 kv lines were originally given a nominal rating of 15,000 kv-a which was adequate for the system loading conditions at the time. With increases in system load, however, it has become very desirable to increase the rating of these lines. Accordingly, the two Plymouth Meeting-Barbadoes Island lines and the two groups of lines connecting between Chester and Upper Darby have been given ratings of 22,500 kv-a, a 50 per cent gain. Limitations in rating the 33 kv lines are usually due to station equipment, although in some cases voltage regulation may be the most important factor. In certain instances involving possible future increased ratings, relay settings in tandem line arrangements will become the major difficulty, imposing conditions which apparently can only be overcome through the use of differential protection of individual lines by means of pilot wires.

5. *13.2 kv Lines and Tie Lines*

The standard 3 x 350,000 c.m., 13.2 kv cable, used for substation supply lines and inter-substation ties has a normal rating of 6000 kv-a continuous and a four-hour emergency rating of 7000 kv-a. The four-hour emergency rating has been effective about two years. The all-day load cycle in most substations results in no higher cable temperatures than would be reached in four hours continuous operation at the peak load for the day. This is a year-round rating, based on investigations which show that the empty duct temperature in most cases is nearly the same throughout the year. The lower summer loads, and load losses, usually more than offset the 5° C higher summer earth ambient. The diversity between the load losses of companion cables in each duct run has been found to be sufficient to permit these loadings without likelihood of reaching the standard A.E.I.C. copper temperature limit of 77° C. There is still opportunity for the use of higher emergency ratings at the risk of some life loss acceleration at higher copper temperatures. An attractive proposal now being given very serious consideration would permit the use of any one of the following emergency load schedules, without appreciably exceeding 90° C copper:

a. 12,000 kv-a per cable for ½ hour, followed by 8,000 kv-a for 3½ hours, or
b. 11,000 kv-a per cable for 2/3 hour, followed by 8,000 kv-a for 3 1/3 hours, or
c. 10,000 kv-a per cable for 1 hour, followed by 8,000 kv-a for 3 hours, or
d. 9,000 kv-a per cable for 2 hours, followed by 8,000 kv-a for 2 hours, or
e. 8,000 kv-a per cable for 6 hours.

These alternative schedules are being proposed as having definite value during such conditions as the temporary loss of a transmission source, or under other conditions when it would be desirable to carry loads up to nearly twice the normal load rating of the cable for periods seldom longer than one-half hour. Eighty-five per cent of this class of emergencies remain acute for no longer than one-half hour. It is then possible to restore approximately normal load conditions.

Whereas the foregoing proposals for emergency load operation of 13.2 kv substation supply cables would require operation above 77° C copper at rare intervals, there are now two banks of six 3 x 350,000 c.m. cables each which have been operated for days at a time at frequent intervals during the past two years, under conditions that are giving copper temperatures in the neighborhood of 90° C. These cable banks, one from Richmond to Delaware Generating Stations, and the other from Delaware Station to Westmoreland Substation, form important links in the bulk power system. The high load factor, coupled with the absence of load diversity between the cables in each of these duct banks, gives this high operating temperature even at the comparatively nominal ratings of 6600 kv-a normal and 8800 kv-a two-hour emergency. The failure rate for these later cables is ten times the system average rate, but the station economies made possible by this operation have far outweighed the increased cost of cable maintenance. The chief cause of cable failures, in these instances of almost daily repeated high temperature operation, has been sheath cracks from repeated sheath bending at points near the duct mouth in the manholes, due to longitudinal expansion of the cables. There has been no evidence of insulation damage. From this we infer that occasional high temperature operation should not be injurious for 13.2 kv cable, even if permitted for one load cycle as often as once each year or two.

The aerial 13.2 kv lines in the urban territory, which are usually of No. 2/0 copper, have been given normal and emergency ratings similar to those for cables. The aerial lines in the suburban territory originate at Emilie, Barbadoes Island, and Newlinville Substation. Some of these have been given various increased normal ratings above the original 6000 kv-a capacity, with present ratings ranging from 6860 kv-a continuously without emergency rating, to 8400 kv-a continuously with 9240 kv-a emergency rating. In all cases the limitations have been imposed by station equipment.

6. *2.4 and 4 kv Distribution Circuits*

The substation equipment is the limiting feature in the rating of distribution

circuits, usually because of induction voltage regulators which have thermal characteristics quite similar to those of transformers. Permissible outputs for two types of above-rating operation have been established, one being the peak load capacity which can be carried during the normal four-hour daily peak load period, taking into account the complete load cycle for the day, and the other the emergency capacity for four-hour periods under abnormal conditions resulting from failure of other facilities following a normal loading period.

The normal peak load capacity has been determined for both 40° C and 25° C ambient temperatures, the range being 110-120 per cent in the former case and 125-133 per cent in the latter, depending upon the normal regulator rating which varies from 150 to 400 amperes. The emergency rating for occasional use, as required by the failure of other equipment or circuits, has been established at 141-148 per cent rating for 40° C ambient temperature, and at 153-160 per cent rating for 25° C ambient temperature. The life loss of the regulator (which is the limiting station equipment) per emergency operation under these conditions will be about 0.1 per cent.

The current limiting reactors are the second most important equipment in the circuits and these have been found to have emergency capacities substantially above those of the regulators for the various conditions, because of liberal design.

An investigation of disconnecting switches has indicated safe operation with 40° C ambient temperature at 110 per cent rating, for most makes and capacities of equipment. For 25° C ambient temperature the capacity has been set at 134 per cent rating, based on the loss relationships under the two different rises to the same maximum temperature. The four-hour emergency capacity of the disconnecting switches has been determined as being 125-150 per cent of rating at 40° C ambient temperature and 152-183 per cent rating for 25° C ambient temperature. The range of values depends upon the individual makes and normal ratings of the equipment. The limiting temperature has been taken as 70° C total in all cases, to avoid excessive heating of the contacts and the possibility of loss of temper of the clips under short circuit conditions. In all cases the conductors connecting with the disconnecting switches should run within a total temperature of 85° C.

For oil circuit breakers, no emergency capacities have so far been developed, except that 110 per cent for four-hour loading and 120 per cent for half-hour loading is being permitted under abnormal conditions with ambient temperatures if 40° C or lower. While it may be the general conception that oil circuit breakers do not have any overload capacity, we think that information can be obtained to show that this conception is too conservative. It is hardly conceivable that any device in which the current carrying parts are so small and in direct contact with so large a surrounding body of oil, should have a faster moving temperature time characteristic than is found in an oil filled transformer.

The conductors of the outside circuits in this class of facility have been found to have emergency capacities at least equal to the substation equipment in all cases, thus a 200-ampere circuit can carry 250 amperes for four hours, or a 300-ampere circuit can carry 375 amperes for a similar period, and so on throughout the range of circuit ratings, as established by the limitations in substation equipment. As earlier pointed out, there appears to be opportunity and use in many cases for a 150 per cent two-hour rating to be followed, if necessary, by 125 per cent for two hours. This is now being given serious consideration.

Various Features Involved in the Application of Emergency Ratings

An important factor in the application of emergency ratings to outdoor transformers is the question of ambient temperature values to be used. An analysis has been made of ambient temperature variations in the vicinity of Philadelphia for many years back through the use of data secured from the United States Weather Bureau. It has been concluded that for typical outdoor transformer installations the ambient temperature should be taken as 10° C for the winter period of November through March, and 30° C for the summer period of April through October.

Winter peaks usually occur after sunset, so that the effect of the sun on the banks is not involved. Summer peaks usually occur during the day and consideration must be given to the direct radiation from the sun which results in an increase of transformer temperature of from 6-8° C, which is included in the 30° C summer ambient given above.

In any specific case where the load on a given transformer bank installation is substantially increased during some one month, the recommended ambient temperature as developed for that month may be used. However, in general it is much simpler and more desirable to use the ambient temperature values for the respective entire winter and summer periods.

The principal limiting feature in the loading of major electrical equipment is the maximum temperature at which it can be operated without undue deterioration of the insulation. The thermal capacity of the equipment will reduce to some degree the maximum temperature which will be obtained during a given load cycle and thus becomes an important factor in the application of ratings for emergency operation.

Studies have been made from which there has been developed a method of calculating peak load values which can be carried by an individual piece of oil-cooled equipment over specific load cycles. The hot spot temperature involves three components, namely the no-load temperature, the top oil rise above no-load temperature, and the hot spot rise above top oil temperature. All of these factors are important in determining the transformer characteristics. A procedure somewhat similar to that for oil-cooled transformers is being used to determine the emergency capacity of air-cooled transformers, current transformers, oil circuit breakers, reactors, disconnecting switches, etc.

A series of curves has been prepared to facilitate the determination of normal and emergency above rating performance for our major apparatus based on representative load cycles. In each of these curves the relationship between the time constant of the equipment and the hot spot temperature is given for various ratios of oil rise to hot spot rise over no-load temperature at constant rated load.

Since ambient temperature conditions play a very important part in above-rating operation of electrical equipment, it has been found necessary to install adequate temperature indicating facilities in distribution substations where previously such facilities were at a minimum. In the case of attended substations where the loading conditions have become relatively heavy, several direct reading thermometers have been installed in each, located in strategic positions relative to

the major equipment. These thermometers are read hourly throughout one day of each week. For unattended substations, maximum and minimum reading thermometers have been provided for weekly reading.

All temperature data are recorded on special forms prepared for the purpose and then transmitted to the Engineering Department for analysis and action as may be required.

Determination of apparatus and line loadings is based primarily upon ammeter readings and it is the practice in the case of equipment having a normal rating only to place a red line on the ammeter scale at the point indicating the full load current rating. The ammeters of equipment to which emergency ratings have been given have a green line placed on the scale to indicate normal rating and a red line to indicate emergency rating. In the cases where a distinction is made between winter and summer ratings, this is shown by individual green and red lines for the two seasons, with an appropriate use of a "W" and an "S."

Conclusion

The policy of above rating operation, where practical, of the major facilities of an electric light and power system is quite definitely effective in postponing the installation of equipment in existing uncompleted stations and also of new stations where adjacent stations have become loaded to near their original rated values. It is difficult to estimate the savings made possible during a given period by above-rating operation, but the specific example given in this paper for one substation indicates very clearly that the application of emergency ratings throughout a system involving some 100 substations and several hundred lines and circuits will result in very large savings as the system load continues to grow.

The increased average loadings which are made possible through provision for above-rating operation will, of course, decrease to some degree the life of the equipment as compared with what would be obtained if the equipment ratings were never exceeded. Even in those cases where the above-rating operation is on the basis of accepting slightly more than normal life loss, however, the average loading will be appreciably below the rated capacity of the equipment and the average life should be at least of the order of the 20 to 25 years which is usually considered normal.

(*Continued on page* 362)

SALES—ELECTRIC REFRIGERATORS

(Household Models Only)

MONTH OF MAY AND FIRST FIVE MONTHS OF 1939-1938

	Month of May 1939	Month of May 1938	Month of April 1939	First Five Months 1939	First Five Months 1938
Total United States	273,966	179,189	260,204	1,145,413	816,483
Maine	1,425	1,345	927	5,137	3,421
New Hampshire	1,039	566	510	3,535	1,993
Vermont	694	519	317	2,125	1,991
Massachusetts	9,748	7,294	9,347	43,133	31,452
Rhode Island	1,062	702	951	5,367	3,269
Connecticut	4,908	2,463	3,269	18,217	11,695
Total New England	18,876	12,889	15,321	77,514	53,821
New York	36,936	22,678	30,277	135,390	94,329
New Jersey	10,682	6,469	11,491	47,002	31,051
Pennsylvania	26,660	16,867	20,778	106,212	77,983
Total Middle Atlantic	74,278	46,014	62,546	288,604	203,363
Ohio	16,977	9,185	15,057	65,889	43,277
Indiana	7,612	4,699	5,182	29,362	21,099
Illinois	23,995	16,752	22,181	94,372	72,796
Michigan	16,194	7,245	13,056	54,670	31,739
Wisconsin	6,439	4,354	5,475	26,873	18,590
Total East North Central	71,217	42,235	60,951	271,166	187,501
Minnesota	8,159	5,333	6,629	33,491	22,161
Iowa	6,039	3,293	6,020	25,912	16,772
Missouri	7,370	4,198	7,396	33,730	25,117
North Dakota	711	449	613	2,599	1,845
South Dakota	835	512	798	3,476	2,212
Nebraska	2,117	1,376	2,293	10,066	6,859
Kansas	2,312	2,146	2,597	12,180	10,804
Total West North Central	27,543	17,307	26,346	121,454	85,770
Delaware	763	403	320	2,702	1,620
Maryland	2,762	2,238	4,408	14,188	10,207
District of Columbia	2,460	2,107	2,269	9,898	9,374
Virginia	4,332	2,166	3,745	18,933	13,385
West Virginia	3,152	1,583	1,669	11,203	8,287
North Carolina	4,919	3,436	5,245	22,884	16,292
South Carolina	1,869	1,646	1,968	9,055	6,912
Georgia	3,258	1,968	3,885	15,621	9,860
Florida	1,947	1,630	2,623	11,978	7,994
Total South Atlantic	25,462	17,177	26,132	116,462	83,931
Kentucky	3,995	2,596	3,465	15,544	10,955
Tennessee	5,278	2,493	4,001	19,136	13,403
Alabama	2,473	1,688	2,925	10,882	8,195
Mississippi	1,825	863	1,243	6,393	4,425
Total East South Central	13,571	7,640	11,634	51,955	36,978
Arkansas	1,576	863	1,691	7,378	5,128
Louisiana	2,730	1,953	3,340	14,337	10,753
Oklahoma	1,770	1,377	3,347	13,303	10,475
Texas	8,204	7,282	12,734	48,005	39,640
Total West South Central	14,280	11,475	21,112	83,023	65,996
Montana	748	426	942	3,899	2,178
Idaho	1,770	660	859	4,734	3,323
Wyoming	386	297	239	1,663	1,080
Colorado	1,822	1,665	1,846	8,028	6,250
New Mexico	312	323	369	1,932	1,673
Arizona	443	393	582	3,392	2,320
Utah	1,334	1,486	1,620	6,140	5,351
Nevada	88	286	238	1,025	1,044
Total Mountain	6,903	5,536	6,695	30,813	23,219
Washington	4,520	2,086	5,113	20,712	13,316
Oregon	2,851	1,547	2,278	10,412	6,675
California	14,465	15,283	22,076	73,298	55,913
Total Pacific	21,836	18,916	29,467	104,422	75,904

Figures based on report by the NEMA on Net Sales to Dealers and Jobbers.

A Liberal Collection Policy That Improved Public Relations and Reduced Operating Costs

By L. M. La Porte and E. M. Wagner
Wisconsin Electric Power Company

MR. WAGNER

PUBLIC opinion is given serious and continual consideration by electric utilities so that good public relations will exist and be further improved. Inasmuch as public opinion is formulated by every contact with the customer, it is necessary that every occasion of company-customer contact be carefully scrutinized and that steps be taken to revise those policies, practices, rules, and methods which have become obsolete and are not conducive to good public relations. Policies and practices which were accepted as desirable years ago may today no longer lend themselves to improve public relations. This, therefore, makes it imperative for utilities to follow a policy of continually placing every customers' accounting practice under the microscope, thereby obtaining the acme of public relations in that phase of work.

During the latter part of 1936, people were recovering from the effects of the depression and were becoming sensitive to having collection action take place on their accounts. An examination of customers' letters during this period indicated that in the interest of good public relations our collection policy again needed attention because of the following situations:

1. A customer received a reminder notice, a sample of which is shown in exhibit A. Upon receiving the notice, he wrote that in view of the fact that he paid every bill on or before the discount date for over three years, he resented our dunning him for a one month's bill of $3.12. An investigation of the account showed that the customer held a fairly responsible clerical position and had paid his bills in the manner he stated.

2. A neighborhood merchant received a cut-off notice, a sample of which is shown in exhibit B, because his account was $7.09 in arrears. He wrote that he had used the company's service for many years and that he felt he was being greatly wronged by our threat to disconnect his service. He believed that his past record entitled him to more consideration. A check of the records showed that he had used the service for many years and that collection action had been followed on his account several times in the past.

3. A residential customer who owed $7.48 for three months' service complained about our collector calling to collect the account. The customer was of the opinion that the cut-off notice he had received would be executed if the entire amount was not paid. The collector, however, would not have disconnected the service if payment had been made on the account or arrangements had been made to pay the account at some future time.

Our examination of customers' letters indicated that there were a sufficient number of the type which had an unwholesome effect on our public relations. It was, therefore, decided to review the collection procedure on accounts which were in arrears. The review of our collection practices from 1925 to the latter part of 1936 showed that they had at various times been modified to take care of situations similar to those listed above. Each of the modifications which became effective was designed primarily to temper a stringent collection policy which caused strained relations. The collection practices from 1925 to the latter part of 1936 were as follows:

In 1925, a reminder notice was issued on all accounts which became in arrears regardless of the amount owing or the period of service. If the account remained unpaid, a cut-off notice was served on the customer, and if the account was not paid, service was disconnected.

MR. LA PORTE

In 1926, it was decided that no reminder notices or cut-off notices would be issued on any account which was in arrears and amounted to less than $2.00. If the account was in arrears and amounted to $2.00 or more, a reminder notice and a cut-off notice were issued.

In 1927, the minimum of $2.00 was increased to $3.00. In 1928, a further modification of the collection practice became effective. It was decided that reminder notices would be issued on all accounts amounting to $3.00 or more, but cut-off notices would not be served on the customer unless the amount owing was $4.00 or more, or the amount in arrears covered a period of six months or more. This upper limit on which cut-off notices were issued was gradually increased until in 1936 the limit was $7.00. The practice of sending reminder notices to customers whose accounts amounted to $3.00 but less than $7.00 continued.

The foregoing analysis of collection practices followed for a period of eleven

WISCONSIN ELECTRIC POWER COMPANY
MILWAUKEE, WISCONSIN

Our records show that we have not received payment of your last bill. If it is not convenient for you to make payment within the next few days, will you please inform our collection division when payment can be made by calling at Customers' Hall, room 279 Public Service Building or telephoning Daly 6600. Arrangements may also be made at any of the offices listed below.

If payment has been made within the last day or two, please accept our thanks and disregard this communication.

Bills may be paid after the discount date at only the following offices:

Milwaukee	231 W. Michigan St.
Cudahy	4805 S. Packard Ave.
Port Washington	301 Grand Ave.
South Milwaukee	2111 10th Ave.
West Allis	1374 S. 71st St.

and at Local Agents' Offices.

FORM 212—1-39—50000

Exhibit A

On the scheduled date, which is about five days after the discount date, the bookkeeping coupons are forwarded to the addressograph group, where the addressograph plates for customers' accounts sufficiently in arrears to warrant collection action are removed from the addressograph file. The notices are then forwarded to the meter reading division for delivery on the next day, which is the meter reading date for the accounts.

years showed that we have gradually become more liberal in our collection policy so as to produce amicable relations. A strict collection policy adversely affects and in some cases destroys good public relations. The fallacy of a liberal collection policy should normally be reflected in the amount of the accounts written off annually as uncollectible. A study was, therefore, made of the percentage of the write-offs for the period involved to determine if a further liberalization of the collection practices was feasible. This analysis is shown below:

Year	Per Cent of Write-off
1925	.3086
1926	.1621
1927	.1563
1928	.1161
1929	.1169
1930	.2125
1931	.2499
1932	.4508
1933	.5307
1934	.2179
1935	.1646
1936	.1061

This analysis reveals that a modification to the then existing collection practices could be made without seriously affecting the company's net return. We, therefore, could accomplish the primary object of making such a modification and that object was to improve the relations with our customers. This would be accomplished by extending an additional amount of credit for an additional period of time. By following a practice of this type, there would also be a monetary gain in operating the collection division at a lower cost than under the former collection practice.

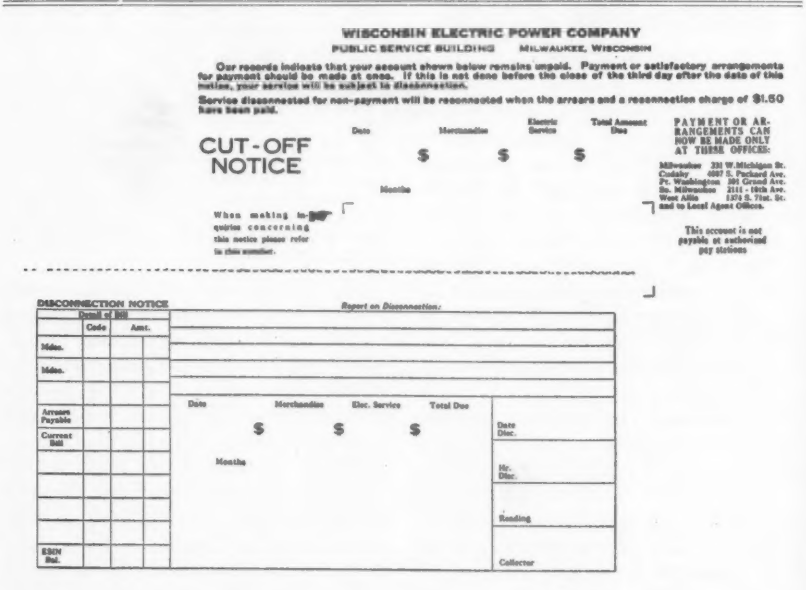
Effective Feb. 1, 1937, the minimum amount and period of service on which collection action would be followed on accounts in arrears were revised as indicated below:

1. Residential accounts—$10.00 or more and more than one month's service.
2. Commercial accounts—$10.00 or more regardless of the period of service.
3. All accounts in arrears six months or more regardless of the amount.

Under this revised practice, no reminder notices were sent to a customer until his account reached the amount and was for the period of time indicated above. Previously the practice had been to send a reminder notice to a customer who owed $3.00 or more. If the account was not paid, no further collection action was taken on the account when it was less than $7.00. If the amount owing was in excess of the $7.00 limit, a cut-off notice was issued, and if payment or arrangements for payment were not made, the service was subject to disconnection.

Under the practice adopted Feb. 1, 1937, reminder notices and cut-off notices are issued on the same basis; formerly they were issued on a different basis. No reminder notices are sent to customers whose accounts amount to less than the amounts listed above. If the accounts on which reminder notices were sent are not paid by the cut-off notice date, which is approximately four days after the reminder notice date, the cut-off notice is issued and mailed to the customer.

The practice defined in this paper applies to all customers of the Wisconsin Electric Power Company with the exception of a small number who are generally classed as habitual delinquents or


WISCONSIN ELECTRIC POWER COMPANY
PUBLIC SERVICE BUILDING MILWAUKEE, WISCONSIN

Our records indicate that your account shown below remains unpaid. Payment or satisfactory arrangements for payment should be made at once. If this is not done before the close of the third day after the date of this notice, your service will be subject to disconnection.

Service disconnected for non-payment will be reconnected when the arrears and a reconnection charge of $1.50 have been paid.

CUT-OFF NOTICE

Date | Merchandise | Electric Service | Total Amount Due
$ $ $

Months

When making inquiries concerning this notice please refer to item number.

PAYMENT OR ARRANGEMENTS CAN NOW BE MADE ONLY AT THESE OFFICES:
Milwaukee 231 W. Michigan St.
Cudahy 4807 S. Packard Ave.
Pt. Washington 301 Grand Ave.
So. Milwaukee 2111 - 10th Ave.
West Allis 1374 S. 71st. St.
and to Local Agent Offices.

This account is not payable at authorized pay stations

DISCONNECTION NOTICE
Detail of Bill: Code | Amt.
Mdse.
Mdse.
Arrears Payable
Current Bill
ESDN Bal.

Report on Disconnection:
Date | Merchandise | Elec. Service | Total Due
$ $ $
Months
Date Disc.
Hr. Disc.
Reading
Collector

Exhibit B

On the scheduled date, which is about nine days after the discount date, the bookkeeping coupons for accounts in arrears in an amount and period of service sufficient to warrant collection action are itemized. The bookkeeping coupons are then forwarded to the centralized typing group, where cut-off notices are prepared. The original copy is mailed to the customer. From three to four days later the notices are checked with the accounts for payments, and the notices for the paid accounts are destroyed. The second copies of the remaining notices are referred to the collector. The third copies are retained in the collection division for follow-up purposes, and the fourth copies are attached to the bookkeeping machines.

are commonly known as unsatisfactory credit risks. These customers' accounts are practically on a cash basis.

The reasons advanced in favor of setting a higher collection limit were as follows:

1. When collection action is taken on accounts covering small amounts and short periods of time, there is a more unfavorable reaction than when collection action is taken on larger amounts and for longer periods of time. A substantial number of customers make payment without being solicited when their bill reaches a certain amount because they know when it exceeds that amount, it becomes more difficult to bring the account up to date.

2. Many of these customers can make purchases at other mercantile establishment in amounts of at least $10.00 on a 30-day basis. When credit extension is held to a smaller amount by the utility, it leaves the impression with the customer that his credit standing is not satisfactory and that his account is more or less on a pay-as-you-go basis. Placing a low credit limit on these customers is taken as a reflection on their character and ability to pay.

3. The increased loss from uncollectible accounts because of a higher collection limit should be very small because the greater majority of the customers are permanent residents and are honest and must continue to use the service. Losses will be incurred from the customers who are habitual delinquents. Their accounts can be properly marked so as to limit the amount of credit.

4. The collection expense should be lower because there would be fewer accounts that would be referred to the collectors to handle. Experience has shown that when the arrears amount to four figures, payment is made by the customer of his own volition. This also results in a saving in the collection costs.

5. When customers permit their accounts to become in arrears, they lose the prompt payment discount. The discounts saved on every fourteen bills will pay one bill. For this reason customers attempt to keep their accounts paid up.

The following arguments were advanced against setting a higher collection limit. The answers to these objections are also given:

1. The practice would educate customers to allow their accounts to become in arrears. It was felt that the customer's lack of training in keeping the amounts owing at a small figure as a result of collection action not being constantly applied by the company would be detrimental to the condition of the accounts receivable.

The answer to this argument was that a company cannot hope to influence the habits of people to an appreciable extent and that because the majority of people are anxious to keep their bills paid and worry when arrears accumulate, a large number of people will not take advantage of the plan to the extent that it would have any appreciable effect on our accounts receivable.

2. More difficulty would be experienced in collecting the larger amounts than in collecting the smaller amounts.

When collectors ask for payments on large amounts, the customers make such payment more willingly, and without derogatory remarks, than when the amounts owing are small.

3. Large losses would be experienced because at the time service would be disconnected the amounts owing would be larger.

The answer to this point was that the accounts of "dead beats" would be properly marked so that they will not receive extended credit in the same proportion as other customers who were only occasionally delinquent.

The practice has been in effect for over two years and it is now possible to determine the success or the fallacy of a more liberalized collection policy. The plan, in our opinion, was successful for the following reasons:

1. In 1936, we issued 201,628 reminder notices; in 1937, 84,169, and in 1938, 103,483. There was a distinct saving in the quantity of forms used during the years 1937 and 1938, in the clerical work in preparing these notices and in the cost of delivering them to the customer.

2. In 1936, we issued 124,307 cut-off notices; in 1937, 83,898, and in 1938, 109,390. There was a saving in the quantity of forms used during the years 1937 and 1938, in the typing of these notices and in the cost of inserting them in envelopes and mailing them to the customer.

3. In 1936, we issued 92,383 disconnect notices; in 1937, 66,177, and in 1938, 86,879. There was a saving in the quantity of forms used and in the collectors' salaries for executing these disconnection orders.

4. In 1936, we disconnected 3,397 meters; in 1937, 1,920, and in 1938, 2,395. This resulted in fewer customers being annoyed by the disconnection of their service and assisted in improving our relations with those customers.

5. The public contact employes report that customers no longer criticize the present collection practice because the customers believe the amount is sufficiently large to warrant the collection action. The employes also indicate that they are no longer placed in embarrassing positions when customers compare the amount owing to the utility with the amount of credit they are able to obtain from other local merchants.

6. The number of complaints relating to the collection policy on small amounts has been practically eliminated.

7. The per cent of uncollectible accounts for the years 1937 and 1938 was low. The per cent of uncollectible accounts amounted to .1042 in 1937 and .1596 in 1938.

8. In 1936, there was an average of 46,551 accounts in arrears monthly. These arrears averaged $327,955.61 a month or $7.05 an account. During 1937, there was an average of 45,746 accounts in arrears monthly. The arrears on these accounts averaged $324,011.96 a month or an average of $7.41 an account. During 1938, there was an average of 46,052 accounts in arrears monthly. The arrears on these accounts averaged $366,043.62 or an average of $7.95 an account. This shows that there were a lower number of accounts in arrears in 1937 as compared with 1936 with practically the same amount in arrears in 1937 as in 1936. The higher figures for 1938 for the average number of accounts in arrears and the amount in arrears a month are due to the recession in business during the year 1938. In view of the decline in business it is apparent that our collection policy is operating satisfactorily. These figures substantiate our belief that very few customers will take advantage of a liberal collection plan.

9. In 1937 and 1938, the collection division was operated with a minimum number of employees.

The foregoing reasons substantiate why we believe that the liberal collection plan has been successful. The above information shows that there were a large number of undesirable and embarrassing contacts with customers avoided during the years 1937 and 1938. A smaller number of collection contacts assists in building good relations between the utility and the customer because collection contacts generally have a detrimental reaction on the customer. In addition to the intangible value of improved customer relations, we were able to operate our collection department at a low cost. The collection department has the following personnel:

Job Description	Number of Employees
Supervisor and assistant supervisor	2
Chief collector	1
Collectors	9
Collector (Meter-ator accounts)	1
Delinquent notice clerks	2
Correspondents	
Skips and moves	3
Merchandise correspondents	3
Correspondence checker	1
Pay agencies clerk	1
Special investigators	1
Counter information clerks	6
Telephone information clerks	3
Suburban office clerks—merchandise and collections (Four—part time)	2
Total	35

As of December 31, 1938, we had the following electric service, heating, and merchandise accounts:

Number of electric service and heating accounts	234,065
Number of merchandise accounts	42,577
Total accounts	276,642
Number of accounts per employee	7,904

The December, 1938, payroll for the employes of the collection department amounts to $5,157.85, which covers the 35 employes listed above. This represents a cost of 1.86¢ per month per electric service, heating, and merchandise account. If we had followed a collection practice in 1937 and 1938 comparable to the collection practice followed in 1936, our collection costs would have been higher.

We have visited a large number of utilities and many utility collection men have visited in our company. We find that some companies still follow the practice that was followed in our company as far back as 1925; that is, following collection on practically every account regardless of the amount and the period of service. However, we have found some who do follow collection on some limits which are substantially below those we have indicated were followed by us in 1937 and 1938. We believe that many companies can modify their collection practice suitable to the needs in their community with sufficient safeguards to take care of those accounts

(*Continued on page* 356)

The Commercial and Industrial Sales Approach

By J. F. Gaskill
Philadelphia Electric Company

Paper presented at the Sales Conference of the Interstate Power Club of New York, June 5.

IN considering the sale of electricity for commercial and industrial use, we must not lose sight of the fact that, in marketing kilowatthours, we are selling something not only entirely different in itself but also different in that the fundamental principles of disposing of the product are entirely unique and outside the experience of any other sales field.

This difference is so extraordinary that I would like to call your attention to the main points of variance. These are:

1. Our ability to sell kilowatthours depends entirely on the success of other people in inventing, designing, manufacturing and selling utilization equipment.
2. We must sell both retail and wholesale, without the intervention of any middleman.
3. Our sales are confined to a small section of the country and are, therefore, dependent upon a highly concentrated local market.
4. Kilowatthours cannot be stored by our customers or by ourselves to smooth our variations in requirements. Rates must, therefore, vary the unit price with usage. On this account, the original sale must be accurately developed to fit the customer's requirements as to service and cost. Failure results in expensive efforts to hold restless customers, bad advertising and loss of confidence in our knowledge of our business. Other consumption goods salesmen may repair a price mistake with the next sale. It is impossible for us to change our tariff as easily as that.

If we analyze the situation I believe we can agree that in commercial and industrial work there are two fundamental conditions to be met before we can say that we have developed a successful sales organization and method of sales. These conditions are:

1. Since our product in itself carries no direct sales appeal our primary sales job is to sell someone the idea of using our product through equipment made and sold by someone other than ourselves.
2. Due to the local character of our market we, more than any other sales organization, are confronted with the necessity of disposing of our product on a fact-finding basis in order that we may have a maximum number of transactions which meet the old definition that "a successful sale is one in which both parties profit." This means accurate knowledge of the market and accurate information as to the dollars and cents results of applying our product to that market.

After all "Selling" is merely the art of persuasion, the blind use of which is apt to be disastrous because such use

MR. GASKILL

disregards the needs of the buyer. The art can only be properly used if directed by knowledge developed from a painstaking research of the field to be developed. It is never successfully used unless the sale is profitable to the buyer.

Now if we consider the two conditions with which we are faced, we must admit that the usual type of sales organization will not fit the problem nor will the use of the generally accepted sales plans and methods meet the unusual market condition. Generally, if you want a man to sell hosiery you employ a man who knows hosiery and can sell it, and so with all the usual production units which are disposed of in the usual market. Such a policy in building a sales organization to reach the market for electricity would result in an entirely uncoordinated sales force, each one of which would be competent to sell only a particular trade such as the ice business, industrial heating, commercial cooking and baking, refrigeration, textile mills, air conditioning, steel mills, etc. This would not, I think, take sufficient account of the fact that we are selling a fundamental idea of service which can be applied to any trade or manufacturing plant. If the salesman is to develop adequately the potentialities of the market assigned to him he must be familiar in some degree with all of the applications of our service to the various commercial and industrial processes. Salesmen not trained in the broader conception of the work are sooner or later confronted by the completion of the job in their special field, and suddenly find that the new fields which have been developed in the meantime have been preempted by other individuals employed for an equally special purpose.

Proper Organization of Sales Force

Since our sales effort in a particular field ultimately approaches a saturation point, if our rates are right and our selling good, our organization should be built so that we can attack the various subdivisions of our field, push them to the point where further pressure becomes uneconomic and then move the same force to another part of the field. This permits of the employment of a fewer number of higher class, better paid men and makes for higher organization morale because of a broader knowledge and conception of the business by the individual salesman.

Under such an arrangement there should be a minimum amount of office work and a minimum amount of handling existing customers on trouble, service and complaint work by the salesmen. The development of this idea leads us to a section primarily devoted to the preparation of proposals, contracts, orders and all requests and follow-up of estimates on the engineering department for service installation, thereby relieving the salesmen of this work and insuring uniformity of procedure.

Since the salesman is engaged solely in contacting and selling the market he should also be backed by a service division which keeps him supplied with engineering information on competitive jobs, furnishes him with complete competitive reports when requested and takes care of the complaint and trouble work and the host of inquiries which always develop among a large number of customers. An important part of the work of the service division is the investigation for the benefit of the salesman of all new applications of electricity as they become

commercially available and an analysis of availability of these applications for the existing market.

Some modification of this division of work is necessary in large unconcentrated areas because of transportation difficulties and scattered forces. I have discussed it primarily for the purpose of pointing out that some means must be found to permit the salesman to do that which he was employed to do, namely, to contact and sell the market. I think it is obvious if he is to do this to the maximum possible degree, he must be relieved of as much office and routine work as is possible under the territorial conditions.

Now that we have considered the fundamental conditions that must be met in the sale of this unique product called electricity, and have also outlined a type of sales organization which might be used to meet these conditions, let us consider the markets which our sales organization must reach. The field covered by an electric utility falls naturally into three sections: the domestic market, the commercial market and the industrial market.

Markets

The domestic market is easily defined and consists of the residence customers. Here direct competition and technical problems are at a minimum, while competition with other products and the problems involved in covering and selling an enormous number of individual prospects are of paramount importance.

The industrial market is also a very definite thing in the minds of most of us. It brings up a picture of busy factories and large blocks of power load. Here direct competition, technical problems and market analyses are of great importance, while the difficulties of coverage are simplified by the comparatively small number of individual prospects.

Between these well defined markets there is a very large number of customers who present something of the problems of both of the other groups. Here technical problems and direct competition, while not so complicated as in the industrial market, are very important. Here also the number of customers, while not so great as in the domestic market, introduces similar problems in coverage and selling in competition with other products. There are no obvious boundaries of the commercial market but for the purpose of this discussion I will define it as including all customers using less than 25 hp. (regardless of the size of the lighting load) for other than strictly residential purposes.

The mechanics of the sales approach to the commercial and industrial markets which we have just defined are, it seems to me, the same. It is true that differences in the character of the markets emphasize this or that problem in one as compared to the other, but the present-day problems are common to each.

This was not always true. Only a few years ago "industrial sales" was almost solely concerned with eliminating isolated plants. Under these conditions aggressive attack was our sole function. Today we possess the market to a considerable degree and, therefore, our function is both defensive and aggressive in that we need to hold that which we have and also to develop new sources of load to replace the exhausted market.

This is not a new phenomenon. All great industries—in fact all nations—exhibit the same grasp of the essentials for virile, active growth through aggressive attack. Only a few, however, have displayed knowledge or ability in answering the dual problems of defense and aggressive development after the original objectives have been obtained.

The original job of industral or power sales was the elimination of prime movers from existing and new plants. Here was a market large in individual increments of load and total possibilities without any of the complications of a mass market in so far as selling expense and coverage were concerned. It could be surveyed easily and covered rapidly. The selling job called for highly developed engineering ability and the complications of each individual sale made it essential to leave the control of the negotiation in the hands of the salesman. The sales problem centered on boilers, turbines, engines, process steam and human nature. The mind of the power salesman was in the engine room.

That market is almost saturated so that we are now in the position occupied by our competitors when we started to sell it. I think we can depend upon our opponents to attack this situation with different or improved equipment or both, and I assure you that their attack will be better organized than their defense. They never knew where or when we would strike next and, as this is the great advantage of the attacking position, we may find ourselves at the same disadvantage unless we show great ingenuity in organization and method.

It seems to me that the defensive function of the industrial sales falls under the following headings:

1. The constant study of competitive equipment and the relation of its performance to the rate structure.
2. The prompt solution of the customer's problems which relate to our service and widespread knowledge among the customers that they can have such help for the asking.
3. Assistance to the rate departments in developing rules and rates which fit the market.
4. Advertising and controlled coverage of the market to insure that the customers know about improvements in our service, never forget the reasons which led them to prefer it originally, and come to us when competitors call.

I think you will find that these defensive functions are also an increasingly important part of our retail or commercial sales operations. The advent of the small high speed Diesel engine and the growing importance of the highly competitive heating and cooking loads require the same type of functional approach in defending the market which has been sold.

Competition is more complicated, more universal and more technical in industrial than in retail or commercial, and the size of the individual industrial loads increases the amount of revenue in jeopardy for each case. Nevertheless the problem is basically the same.

This is also true of each of the other three headings which I suggested to cover the defensive function of industrial sales. They apply equally as well to the retail or commercial sales.

I would like to point out here that the approach suggested by these headings is in the nature of preventive medicine. If the best methods for using it in a given territory can be found the market will be friendly and sales resistance will be low, both of which are of vital importance to the second function of industrial sales—namely, the development of new load sources to replace the exhausted isolated plant market.

Market Approach

When the isolated plant market has disappeared—and that day is not far off—then the industrial salesman must find his market on the other side of the engine room door, in the manufacturing processes and services of the plant. The boiler factory, the candy plant and the silk mill may exhibit the same kind of problem in the engine room, but their processes are amazingly different.

Similarly in commercial sales, the salesman must find his market in the processes and services of his customers. Fewer and less complicated processes here, and with less diversity of equipment it is true—but fundamentally the same type of work.

In both of these markets which must

be developed while we maintain an aggressive defense some way must be found to enable our salesmen to know the processes, the applications and the available equipment well enough to bring them together soundly and intelligently.

Furthermore, all of these men must sell many comparatively small applications more rapidly to maintain sales volume. Therefore, each application must perform in accordance with our prediction if sales resistance is to remain low enough to maintain selling speed. This implies a volume of technical knowledge of equipment performance and its effect on the customers' load cycles which is beyond the reach of an individual.

It seems to me that this brief sketch shows, rather conclusively, that the fundamentals of market approach are the same for industrial and commercial sales. In each we must defend a market against competitors, decrease sales resistance by sound sales philosophy and develop new load sources from the processes and services of our customers' plants.

Certain characteristics peculiar to one or the other market make it difficult to accomplish the desired result economically and adequately, but these point to a difference in methods rather than a difference in approach.

In short, to defend and build load in either market, we must:

1. Know the market.
2. Cover the market.
3. Analyze processes and applications.
4. Know available equipment and its performance.
5. Sell accurately to reduce sales resistance.
6. Never forget that we cannot sell our product until some one else has sold equipment.

Like most things that are true, these six points which determine similarity of approach are quite old, well known and apparently simple. However, there is much more in each than casual reading would indicate.

Knowledge of the market means something beyond the names, locations and business of the customers. It means some insight into the condition of the business, the character of the owner or operator and his problems. This knowledge must be sufficient to permit the salesman to translate the satisfactory solution of those problems in terms of our service. In the words of a man unknown to me: "Find out what the market likes and do more of it. Find out what the market doesn't like and do less of it."

If the necessary knowledge is to be acquired the market must be covered. Not in a hit or miss fashion but completely and adequately in an orderly and organized manner, which permits the greatest number of calls to be made where most needed but which also avoids neglect of customers.

Incidentally pressure for coverage must be handled with judgment. Too much emphasis will produce a phenomenon similar to clutch slippage in an automobile. The salesman may get the idea that calls are more important than results.

We must analyze processes and applications and we must know available equipment and its performance if we are to solve the customer's problems in terms of our service. If the salesmen are to obtain the necessary knowledge of the market and the coverage, it seems apparent that this analytical work must be done for them and kept up-to-date in an orderly and accessible manner.

Accurate sales to reduce sales resistance are of the utmost importance. In both industrial and commercial work we must sell each customer many different applications. One sale which results to the customer's disadvantage makes a bad friend, increases his sales resistance to our next proposition and creates a bad advertising medium which stiffens the sales resistance of his friends and associates. Such a check on rapid selling is a serious matter in developing markets where sales volume is dependent upon the quick sale of comparatively small increments of load.

Selling speed is important in present-day industrial markets. It is imperative in the retail or commercial work because of the low revenue per customer which limits the selling expense.

Since it is true that we cannot sell our product until utilization equipment has been sold, it seems obvious to me that the sale of the idea—which is our job—and the sale of the equipment should be coordinated. Cooperation with the manufacturers and outlets of equipment in advertising and selling should be established wherever possible. Certainly there is a common interest which can best be served if we and they work together on the same customers, at the right time and in proper sequence of effort.

In concluding my brief discussion of the six fundamentals in selling industrial and commercial loads I want to point out that each one fairly shouts the need for some form of continuous personnel training. Many courses in salesmanship are available for this work and almost all companies have set up a program to fit their own local requirements. Therefore, I believe it is sufficient to mention the need without discussing it at length.

Throughout this paper I have been strongly tempted to talk about several things which seemed to me important but which would have represented a considerable extension of my subject. From the utility viewpoint the problem of building load which is balanced within rates and between load classifications is of particular moment.

I have attempted to demonstrate the similarity of market approach which is required in industrial and commercial sales, without going too far into the market differences which affect methods and tax our ingenuity in finding ways and means of doing the job in the desired manner. Those differences need no great amount of detailing to you who are meeting them in your daily work.

Although their market for new load has changed, the industrial salesmen will find that their work requires even more ability and training than ever before. They are contacting the same group of customers. They will sell many complicated technical jobs instead of one, and every now and then they will find it necessary to go back to the old technique and keep an isolated plant from invading the market.

The retail or commercial salesman has these same problems in a much lesser degree. His best efforts will be continually demanded to increase speed of selling, so that selling cost per dollar of revenue may be reduced.

I do not believe either should be concerned about not having enough to do because there are innumerable applications to sell thousands of customers and more are being invented every year.

A Liberal Collection Policy

(*Continued from page* 353)

which require monthly surveillance. This would permit them to eliminate a certain number of collection contacts with customers who have a fairly satisfactory credit standing but are considered slow pay among mercantile establishments in their community. Fewer collection contacts will result in improved customer relations and in reduced collection costs.

This paper is presented to inform the electric industry of the results and the benefits of our experiment in allowing a definite amount of credit over a definite period of months to electric service customers, which resulted in improved relations and lower operating costs.

Southern Industrial Development

By Earl B. Morgan

Manager, Blueridge Company, Inc., Glasgow, Virginia

A talk before the Industrial Power Conference, Southeastern Electric Exchange, Charlottesville, Va., May 11, 1939

THE SOUTH, I firmly believe, is now on the threshold of one of the greatest industrial developments that any section of our country has ever experienced. The only things that seem to be restraining this development are the general uncertainty as to international relations and the lack of confidence of investors which in the main seems to be due to the set up imposed on business in general by government. Remove these influences and I will risk the forecast that it would be a problem not of development but of control.

Industrial development can come about either by, first, growth and improvement of existing industry or, second, bringing in new industry. Too frequently the second of these is the sole interest of power and other public utility men. The first also merits attention and much of it. In fact, I believe a live interest in the growth and improvement of industry already in a community will serve as a very potent recruiting force to bring in new industry. Successful business performance is bound to attract desirable new industry to any community—no drives or other promotional effort can quite match it in effectiveness.

Due to changing conditions and habits of living, particularly brought about by the gasoline motor development, there is now under way a great decentralizing movement in both population and industry.

In highly congested sections, industry to a large extent now faces the problem of relocation. Its present locations made under previous influences are fast becoming out of date and it finds itself more often than not in the wrong place under the modern order of things. It must move—not from smaller to larger places, but from larger to smaller places. The lines of economic advantage lead "out" not "in" under the new set up.

This decentralizing and relocating of industry is just made to order for the South because it has numerous advantages to offer any particular industry faced with this problem.

The South has a wealth of virgin industrial sites of the type that is just made to order to fit the modern idea of ruralizing industry, the kind that a manufacturer can develop advantageously if he is willing and able to recruit and train his own organization from the ground up out of inexperienced people.

As a whole the South has a very high percentage of native-born, white, non-floating people of above average educational level, and a minimum of foreigners. An All-American payroll has a big appeal to modern industrial management.

Throughout the South there now exists a very satisfactory diversification of industry. And there is practically no section suffering from congestion due to over industrial development.

The South has kept remarkably free from labor strife and lawlessness, particularly during the recent troublesome years. It can well be proud of its record. It has attracted much attention and envy in industrial circles where management has been harassed due to labor troubles.

Southern climate is temperate and fairly stable throughout the year. It is a climate well suited to most any kind of industry and its workers; it is economical as regards heating, housing and clothing.

Most all sections of the South are in a very satisfactory condition as to highway development and the coming years are bound to see continued improvement.

Railroads in the South are in as good shape as the average throughout the nation, and in some cases better. However, the question of freight rates must be given immediate and earnest attention if southern industries expect to be able to compete with advantages enjoyed by most northern and mid-western concerns.

As to natural resources, the South is well blessed.

Now let's look at taxes, that all important matter to industry, particularly during these times of excessive governmental spending. It is my observation that southern states are on the conservative side, some in particular have stood out as examples of sound fiscal policy. The fine record of Virginia inaugurated by Governor Byrd in keeping government on a pay-as-you-go basis with resulting reasonable taxes is an example and no doubt has had much to do with the recent remarkable industrial development in this State.

All of this can be summed up as political stability which means much to both existing and new industries. It insures confidence that a coming election will not turn loose a group of demagogues, reformers, wild spenders, and unbusiness like theorists ready to crack down on business and industry.

States and local communities that spend extravagantly and constantly raise taxes are simply taking industry for a ride and showing them the gate. There could be no more effective warning to industry to move out and stay out. What announcement could have more industrial promotional value than a statement by those in charge of state and local governments that they were going to follow a firm policy of strictest economy with the objective of bringing taxes to a minimum and holding them there? Wouldn't this be sweet music to industry?

Then wouldn't it be just swell to add to this a guarantee by state and local governments to give business and industry fair and sensible administration of the laws governing their operations; to protect the constitutional rights of industry and the right of every American citizen to work for others or go into business for himself; and to see that no individual or group be allowed to infringe on the rights of another individual or group?

I believe that we have a very general appreciation of the obligations of government in the interests of industrial development throughout the South. However, it is the duty of every one of us to promote the continuance of it.

I don't think pressure on politicians from the top is going to be nearly as effective henceforth as to awaken the average wage earner to the fact that his welfare and progress, as well as that of his

family, depend on industry, and that when some wild politician or group cracks down on industry, he is really the one who suffers. If through our daily contacts with our employees we can gradually educate them to elect to office only those politicians that are going to safeguard the interests of business and industry, then we will get results, because politicians will listen to the voter as they realize it is the voters who send them back to office.

Many of you power men have had contact with new industrial prospects; therefore, you can appreciate that these prospects are generally babes-in-the-woods when it comes to looking for new locations. Rarely do they know what they want or should have. About all they know is they want to get away from trouble of some kind. The trouble may be one or several of such as the following: labor, poor location, lack of room or facilities for expansion, plant obsolescence, unsatisfactory community attitude, taxes, uneconomic transportation or material supplies.

In my experience few prospective new industries know the first thing about making a location survey or where to get aid and information. As a rule the approach is from the geographical and material side—the tangibles, to the neglect of the intangibles such as the all important sociological and governmental factors. I can not forget a case I encountered where a site was selected just because an owner liked the country, particularly the fishing and hunting.

Rarely do prospective industries put their task in the hands of one experienced in industrial management, particularly in new location and industrial development work. This makes it difficult for experienced men in the industrial departments of utilities and railroads to serve them to the best advantage.

Is it any wonder that many prospects falling into the hands of high pressure salesmanship, launch a failure? And one failure may break a community. Certainly there isn't a power man that would want a failure launched on his line; he knows good and well that the industry must succeed to become a profitable account. That is why I know that you and all your companies stand for promoting the right kind of industrial development.

Let me offer some suggestions which I believe will be of assistance in promoting sound industrial development:

1. Promote the development of existing industries by encouraging through every available channel sound governmental policies and administration, by offering promptly every worth while service facility at the command of your power company, by keeping our power service at maximum of economy, efficiency and dependability, by encouraging favorable community attitude towards industry, and by setting an example of good industrial management in the conduct of your own business, particularly in the handling of labor and public relations. Business today in the face of the maligning it has suffered needs as never before favorable public opinion.

2. Do your part to see that those agencies in the community that are interested in promoting incoming industries seek and encourage only high grade and stable concerns that have good reputations, good financial standings, and records of good modern industrial management in all its phases.

Thinking on industrial development has advanced far since the days when a smoking factory chimney was hailed as a god-send and when every addition to employment, regardless of wages, hours, working conditions, or treatment was considered an economic salvation.

3. A concern that wants to move into your community so that it can exploit labor is not going to be a good neighbor. The doors should be closed and kept closed to this type of new enterprise. Such an industry will promote industrial decadence rather than industrial development. In contrast, go after the kind of industry that is willing and ready to pay a good living wage and keep in step with the general wage level of the community.

It seems to me unfortunate that the phrase "cheap Southern labor" has been so frequently used. It reflects unjustly on the calibre of the workers. Also, it has some appeal to those who are inclined to gain advantage by "chiseling."

The South abounds in rural industrial locations where the worker can undoubtedly be maintained at a better standard of living on a given wage than in most highly congested metropolitan sections. Therefore, an industry that brings its plant to a rural district and suffers some of the handicaps and loss of conveniences of metropolitan centers should be able to compensate by enjoying the economic advantage of a wage differential. The new Wage and Hour law is going to present a real problem in this connection because in administering the law there seems to be no intent to recognize wage differentials dependent on climatic conditions, cost of living and other economic factors, thereby militating against rural industrial development and operation. And let us not forget the South's field for new industrial development is more rural than urban. It may be of interest to you to get a copy of the resolution passed at the recent annual meeting of the Virginia State Chamber of Commerce calling attention to this unfair influence that seems to be resulting from the act.

4. Encourage the industry that is willing and able to develop virgin industrial territory, particularly rural, and train its own personnel. One that will not import outside labor and will not dislocate the natural distribution of workers by bringing in workers from other sections. Such an industry must be prepared to set up and operate its own apprentice training and teach not only the technique of the particular line of business but also industrial conduct.

5. Analyze the industrial assets and liabilities of the community and weigh them carefully against the requirements of the prospective industry.

What is a good business for one community may not be so for another. If the particular section is highly developed in agriculture, then the prospective industry should be able to blend into an agricultural set-up, utilize the agricultural type of help and be ready to adjust itself to the seasonal employment requirements of the farm.

The supply of female and male labor must be considered against requirements, similarly the general age level and education.

Favor the industry that has a com munity view point and is ready to assume its share of community obligations, one that realizes that as the community succeeds so will it succeed. Let us call it a double track philosophy. As it gives so will it receive. The type of industry I have in mind will try to develop a local public opinion that the industry in effect belongs to the community which will result in the influential members of the community promoting and safeguarding its interests. Than this, there is no more valuable standby in an hour of trouble. The lowliest storekeeper or barber can often do many things to effect better labor and public relations for a management that it could not do itself.

Most every community has some peculiarity with which the prospect must reckon. Some communities don't seem to want an industry because they fear it may destroy a certain atmosphere or

mar some cherished characteristics, whether of natural beauty or historical, perhaps both. Whether such resistance is justified or not is aside from the point. If it exists, to force an industry onto such a community would be a grave mistake. An industry must have community receptivity.

6. Encourage the industry that is ready and able to pay its own way and is not seeking gifts and unreasonable concessions. Look out for the prospect that has the "gimmies."

Unusual tax exemptions and other grants only tend to increase the load on existing business and industry. Someone has to pay for free rides in the long run. Of course local participation in sound financing does not come under this head.

Special concessions generally set up a pressure for special privileges sooner or later by some person or group. Good management does not want to operate under such a handicap, it prefers to manage its business unfettered by patronage obligations.

7. Plan against over industrialization of any particular section and at the same time encourage diversification. Let us not forget that congestion is apparently causing many industries to consider relocating. Also, too many eggs in one industrial basket is bad for any community. If the available workers in a community are all engaged in one type of industry then there is no relief against the shutdowns of that industry—everybody is out of work.

8. Beware of absentee management. If employees come to feel that their destinies are controlled by someone unknown to them and not on the ground and familiar with them and the conditions, then personnel and public relations are almost bound to suffer. There have been actual examples of a new industrial project failing to "click" because there were imported managers and supervisors with decided sectional characteristics, incapable of adapting themselves to local traditions, customs, personal traits, and incompetent in human dealings.

Absentee ownership should not be a handicap provided it establishes and stands back of a qualified and competent autonomous resident management; however, any trace of undermining this management by "butting in" on administration of policies once they are determined is bound to cause trouble.

In the coming era of industrial development of the South, it is sincerely hoped that more southern financing will come about. Southern money behind southern industries should be the aim. It will be bad if our future development becomes simply an industrial colony of the North or any other section for that matter.

9. New industry coming into the South and also industries already here should be ready and willing to enter into the activities and work of the various state, local and other organizations which are operating for the general interest of business and industry. Too many "sit back and let George do it." An industry will get out of any good organization in proportion to its participation.

10. Would it not be advisable for those agencies promoting industrial development in the South to devote more effort than has been apparent to the development of entirely new types of industries adapted to southern conditions, facilities and resources rather than get into the competition of attracting industries to pick up and move?

11. The men responsible for industrial development for power companies, railroads, and local agencies such as Chambers of Commerce, should not only know the advantages but also the limitations of their communities for various types of industries. Drawing on my personal experience I would say many are too much inclined to boost their stock too high—sell short. Too few have real dependable information or know where to get it. One of the best men I met in my surveys contributed more by contacting me with well informed parties than he did by the actual information he was able to furnish. May I also suggest that a little more knowledge of industrial management and its problems would also help.

12. I have purposely reserved this point for the last because I deem it most important:

Be sure that the prospective industry has a modern conception of personnel management.

Never before has personnel assumed such importance in industrial management. Further than this, it has become a major national problem. The recent legislative and collective bargaining approach to the labor problem can be attributed in a large measure to the past indifference of management to the human relations of their enterprises. Let us face facts, if management had been on the job of personnel management in the past, it would not now be facing such severe legislation.

I am impressed that we are endeavoring to accomplish by legislation certain results impossible to accomplish in this way. You can no more legislate good human relationship than you can good domestic relationships. Our statutes today define who the parties to the conflict are to be, if conflict is to take place; but this is only the beginning. I certainly have no quarrel with the proposition that employees be given the right to deal with their employer through representatives of their own choosing. I think this is sound. But there still remains the big job of building up the proper relationships to make it "click."

I contend that collective action is not always necessary for good personnel relations. There are many examples where both employees and employers are satisfactorily working out their mutual problems through individual action, also cases of a happy mixture of individual and collective action. I further contend that if a particular group of employees is perfectly satisfied with personal individual dealing with its management, it should be allowed to continue and not be forced to change due to outside pressure.

No industry is too small to have someone whose primary job is to help shape personnel policies and administer them. But this man can never proxy for the big boss.

The my-door-is-always-open-to-any-of-my-employees type of big boss is passing from the picture. Employees don't contact their big boss naturally. The big boss must contact them and sell them a bill of goods of mutual confidence and interest—a real selling job.

We have learned that the real starting point for personnel administration is in the mind, heart, and spirit of the big boss of the concern. Unless he is dedicated to doing the best possible job of personnel administration any system will be futile.

The boss and his personnel specialist must aid the line organization in the development and execution of sound personnel policies. The aim should be to make each foreman and supervisor the personnel man for his own department, not relieve him of the responsibility, rather impose it on him.

It would seem apparent to any student of personnel relations that you can neither legislate nor contact the spirit of mutual confidence and friendliness that must exist between workers and management. Good morale is the objective of good management. These only come

through the initiative performance of the management, from the big boss all the way down the line. Management today is faced with giving up once and for all the right to make arbitrary decisions that affect so vitally the welfare of human beings in industry. It must develop the worker's confidence and cooperation by giving him a voice in any matter—no matter how trivial—that affects his employment. He must be happy at his work.

There is no one successful system of personnel administration, but almost any system seems successful if the spirit and philosophy of the management are right. Those that have been successful seem to have these fundamentals in common: Utmost care is exercised in selecting and placing employees. Training of the workers and line executives is not left to chance but is carefully planned. Advancement within the organization is safeguarded. Wages are set so that there is opportunity to earn commensurate with effort and so as to afford a good standard of living, and in step with the prevailing wage of the community. Best possible working conditions are provided. Reasonable hour schedules are in effect. Safety and sanitation are constantly followed up. Every effort is made to secure the job against seasonal and other fluctuations. And last, good treatment in human relations and the establishing and maintaining of good morale are constantly the goal.

Constant attention to this most important of all management problems, personnel, should be the watchword of all southern industry and business as well as a requirement for all prospective ones.

A golden opportunity lies ahead for the South, one that was not available to other sections of our country that pioneered in our national industrial development and that have paid so dearly in human suffering and incalculable loss of production because of labor conflicts.

The South has the great opportunity to profit by all this experience and twenty years of improvement in the technique of personnel administration and stay clear of the rocks of labor conflict.

I believe the best promotion we in the South can give to our industrial development is to show the way to better industrial management in all its phases with particular emphasis on personnel. Along with this, let us encourage conservative politics and financing.

Dividend Arrearages a Symptom of General Conditions

IN a reply to Judge Robert E. Healy, member of the Securities and Exchange Commission, who commented upon utility preferred dividend arrears at the Harvard Business School Alumni Association on June 16, C. W. Kellogg, President of the Institute, made the following statement on June 24:

"Judge Healy stated that there were aggregate arrearages in preferred dividends of some $96,000,000 in operating utility companies and $337,000,000 in utility holding companies as of January 1, 1938, and comments thereon that "as long as such accumulations of arrearages remain uncorrected it is idle to talk about an equity capital market in the public utility industry."

"Preferred stock dividend arrearages, which have developed almost entirely since 1932, are not the cause of the condition of the equity capital market, but are more the effect of that market, which in turn is and has been influenced by the conditions both economic and governmental that the utilities have had to face. From the figures given below it is clear that the preferred dividend arrearages are but a symptom of a general condition. They are not the reason for a lack of market for equity capital but the result of it. Utilities today, even where all preferred dividends have been paid, cannot sell their common stock at the property values they represent.

"1. Taxes paid by electric utilities since 1932, principally due to increased Federal taxes, exceed what they would have been at the 1932 ratios by a cumulative amount of $297,000,000. This is nearly 70 per cent of the combined arrearages cited by Judge Healy.

"2. Since 1932 over $177,000,000 has been taken out of earnings or cash assets for new construction. This amount would have been available for dividends if it had been feasible for utilities to raise funds by the sale of securities.

"3. Rates, following a long time trend, have been progressively lowered but, since 1932, under the pressure of subsidized government competition, they have been reduced somewhat at the expense of the stockholder. The difference between domestic revenues actually received since 1932 and what they would have been at the rates prevailing in that year, makes a cumulative total of $479,000,000. Very substantial reductions have also been made to other customer classes.

"4. A substantial part of accumulated unpaid preferred dividends by operating utilities represent cash expended for retiring maturing obligations. In the case of one operating company, representing 1/10 of the total preferred arrearages of such companies, the entire arrearage is accounted for by such debt payments. This was necessitated by the fact that even bonds of the company in question could not be marketed at any price which a commission could approve.

"5. A considerable part of the preferred dividend arrearages of electric utilities arises from thef act that their operations are combined with street railway operations which have suffered losses from reduced traffic and higher labor costs.

"The total disbursements of operating electric utilities since 1932 for interest and dividends were $4,565,000,000 compared with which the $96,000,000 of accumulated preferred dividends of such companies becomes relatively minor—about 2 per cent, and the total arrearages in the preferred dividends of both operating and holding companies is less than 10 per cent of this amount.

"The general performance of the utilities during the depression has been reassuring to investors. The depression in market values of equity securities, while partly a reflection of general business conditions, has been principally due to attacks by the Federal Government. A change in this attitude should have a stimulating effect on utility equities.

"Judge Healy spoke encouragingly about the Holding Company Act: that 'it recognizes and does not impede the earning of proper profits,' that it 'does not mean a death sentence for . . . the utility holding company' nor 'the nationalization of the utility industry.' He failed to point out, however, that Section 11 of the Act does require the forced sale of holding companies of many properties fairly and honestly acquired and well operated in the public interest which cannot be retained even under the ABC provisions of that section which he quotes. A forced sale is never a fair sale."

Power, Commerce and Industry in the Pacific Northwest

By Walter W. R. May

Director, Industrial Development, Portland General Electric Company

From an address before the Pacific Northwest Regional Planning Conference, Seattle, Wash.

IT is necessary to face the issue of private enterprise versus public ownership politics here in the Pacific Northwest because the President and Congress found already existing in the states of Oregon, Washington and Idaho, the very pattern upon which the Federal Power policy was cut, namely, low rate of cost and high rate of use.

Power here is cheaper than in 45 other states and is more widely used in proportion to population than in any with the possible exception of California and there only because of the relatively greater density of rural and suburban population. Power as an industrial force and as a public service was pioneered in the Northwest. No large area in the entire country—in the United States and Canada, has surpassed this area in the use of power. In the much-pointed-to Province of Ontario, Canada, where a great public ownership experiment was undertaken, Human Needs have not been met as rapidly as in our own Pacific Northwest, and human happiness is not more real or apparent. The Standard of Living in Ontario is by all accepted measurements no better. It is *in fact lower* if we would judge by the standards that appeal to the American public. Power was not alone the dominant factor in the heavy industrial development in lumber, paper and minerals there. Raw materials, a supply of cheap labor, lower taxes and nearness to markets, were large contributing factors. Some of these factors the Pacific Northwest does not have.

We may expect Power to be a contributing factor in our future development in the Pacific Northwest:

1. On the basis that the Federal laws providing for the administration of Bonneville are interpreted so as to encourage rather than restrict the investment of private capital in new industry and in the development of our raw materials and natural resources.

2. On the basis that we so limit the services performed for the people by government that our taxes are not confiscatory.

3. On a basis of using our Federal power projects such as Bonneville and Grand Coulee as multiple purpose projects to aid navigation, open up new country, provide irrigation and contribute to economic thrift through Control of Floods and Soil Erosion as well as the generation of power. Politics should not obscure the real purpose of the projects.

We may expect Power to aid in the Solution of our Industrial Problems by attracting to the Pacific Northwest industries working in one or more of the above groups where power used at high demands and high load factors is a large, if not deciding factor, in the cost of the finished or semi-finished product.*

In the group of industries listed, raw materials are either available by rail or truck in the four Pacific Northwest States or can economically be shipped in by water. These industries are the users of about one-tenth of all the power used in the United States, now about 120 billion kwhr annually.

But the controlling factor in determining to what extent any of these industries can be brought to or expanded in this area is whether the savings that can be made through low cost power at Bonneville or Grand Coulee or through any private or municipal plant will be great enough to offset the additional expense of working the raw products here and transporting the finished product to markets in the Middle West and East. Although some of these industries use power on a high load factor and power is from 10 to 25 per cent of the cost of the finished product in such industries they could not afford immediately to remove their plants to the Pacific Northwest or expand their operations with new ones, if power were given to them free at Bonneville or Grand Coulee.

There is great danger of sadly misleading the public by loose-talking to the contrary.

In view of these facts, which engi-

Product	Kwhr per ton finished product required	Cost per ton On 100% Load Factor At Dam	On Line
Aluminum	20,000 to 25,000	$33.00	$40.00
Zinc & Cadmium	2,000 to 3,000	3.30	4.00
Copper Leaching Method	1,700 to 2,600	2.80	3.40
Caustic Soda & Chlorine	2,300 to 2,800	3.80	4.60
Metallic Magnesium	13,000 to 14,000	21.45	26.00
Steel	500 to 750	.85	1.00
Ferro alloys (Chrome, etc.)	5,000 to 10,000	8.25	10.00
Calcium Carbide	2,600 to 3,200	4.30	5.20
Abrasives and Refractories			
Fused alumina	2,000 to 2,500	3.30	4.00
Silicon Carbide	6,000 to 8,000	9.90	12.00
Silicon	12,000 to 14,000	19.80	24.00
Graphite	7,600 to 8,000	12.54	15.20
Phosphoric Acid	5,000 to 6,000	8.25	10.00
Oxygen and other Gases including synthetic ammonia and hydrogen			
Metallic Sodium	13,000 to 15,000	21.45	26.00
Carbon Bi-sulphite	850 to 1,000	1.40	1.70
Pulp and Paper	1,200 to 1,400	1.97	2.40
Fertilizer and other agricultural chemicals	variable		

*Power at $14.50 per kilowatt year at dam is 1.65 mills per kwhr, 8760 hours to the year, on 100% load factor.
Power at $17.50 kwy on transmission line is 2 mills per kwhr on 100% load factor.
Power at 2 mills is $2 per 1000 kwhr on transmission line or at 1.65 mills at dam is $1.65 per 1000 kwhr.
Cost per ton finished product as indicated in the table is calculated at dam and on line at minimum requirements in round figures.

neers do not dispute in the face of the sluggish industrial growth of one or two towns in the Northwest where power rates are even lower than the Pacific Northwest low average, it is very necessary that we not restrict and narrow our present industrial tax base by confiscating existing tax-paying industry.

In our planning we should take note of the fact that the Tennessee Valley navigation and power development has apparently forced a tax blight upon the states of Tennessee, Georgia, Mississippi, Kentucky, and North Carolina. The loss of the counties in Tennessee alone and to the state of Tennessee, is above $3,000,000 annually because of the pending sale of the Commonwealth and Southern Company's properties to the TVA and the municipalities of the state.

The entire philosophy of federal paternalism in public service, and industry is changing because of the impending tax blight in that area. Against such a tax loss the gains to individual citizens by such govermental largess is not at all as yet apparent.

In planning for migration and the development of economic opportunities in the Pacific Northwest, due consideration must be given to the fact that Bonneville should be loaded up in 15 years and enough power sold in 40 years to pay for the 4/7 of the cost of the project that will be charged to power on the government's books.

Unless industry—New Industry—comes in apace to sustain the new migration no new migration can swell the population fast enough to enable residential and rural consumers to utilize all of the 10 units at Bonneville. Any five paper and pulp mills in the Portland area consume more electric energy than all the 100,000 customers, more or less, classified as residential consumers in the Portland area, notwithstanding the fact that the Portland residential average use is approximately twice the national average. A comparable statement may be made of the situation in Seattle, Spokane or Tacoma.

At the present rates of $14.50 and $17.50 per kilowatt year respectively at dam and on transmission lines Bonneville Power is the cheapest power at wholesale in the United States or Canada where a large demand and high load factor are possible. This is so because the rate is based on only 4/7 of the cost of the project, 3/7 being a gift to the people in the name of navigation, and because the project *will not have to earn any taxes whatever* and *will pay interest at a low rate on only part of the investment.*

Since even this low wholesale rate means to small consumers whose load factor is of necessity low, a retail rate not appreciably lower than they can buy on a kwhr basis today no millennium in our power economics can be expected for those new residents of the area who are coming with the migration under consideration. As to industry, it is apparent after nearly a year of power availability at Bonneville, that there are economic and psychological factors that have to be reckoned with.

With a present installed capacity in the Pacific Northwest today of 1,381,000 kw, Bonneville now having in addition 86,400 kw of its 504,000 kw ready, and Skagit's increased capacity available before Coulee's 1,250,000 kw actually come in, it is clear that the available power will soon be so great as to call for the utmost cooperation of all forces, the sublimation of political power issues and prejudices in favor of sound economic practices and the cooperative effort of private enterprise and public facilities, certainly in the spirit of, and almost to the letter of, the formula laid down by President Roosevelt. If we can do that, task of planning for the Pacific Northwest's development will be easier and the good results sooner available.

In fact on some such program we may expect in due time to see our power at Bonneville and elsewhere in the four Pacific Northwest states used to reduce the phosphate beds of Idaho and Montana to the magic black dirt that will make fertile and fecund again our tired and worn-out acres to receive our newcomers.

Likewise, at Bonneville and elsewhere in the Northwest, there exists power cheap enough to attract capital to convert the chrome of Oregon and northern California into the alloys that make rustless iron and steel, light structural frames, our shining chromium plate auto parts, surgical instruments and tempered precision tools.

Somewhere, under such a program, capital will be found to share with power the task of converting our low grade iron ores into an integrated iron and steel industry, and our magnesium into the metallic alloys whose era of use is just dawning.

Some day a forward-looking mind will venture to fuse our clays with the aid of power into the refractories and ceramics to line the furnaces of the industrial East, to make our terra cottas and our pottery for the growing population of the Pacific Northwest.

On such a program of cooperation between government and private capital we may expect to make aluminum from our alumina clays not only for our auto parts, cooking utensils and airplanes, but also for our bridges, our insulating wall papers and light but strong building reinforcements.

From beneath the dry beds of our vanishing lakes in Oregon we may some day take the brine that reposes there and with the aid of power convert it into the chlorines and caustics for our expanding paper mills and from our sea water and saline springs power can extract the bromine for the nation's dyes, medicines and gasoline.

Calcium carbide from our limes and coals; fertilizer and smelting flux from our phosphates, our limes, our silicas and our magnesium are other payroll possibilities from our power.

From our pulp woods an expanding industry will grow, not only to provide the rayon pulp for foreign mills but to form the basis of a textile industry in rayon yarns and garments, rivaling those of the South and New England.

These things are no flight of the imagination. They are real possibilities if government cooperates with rather than confiscates private enterprise. A program of cooperation, therefore, makes power a big factor in the development of the Pacific Northwest and in meeting the human needs of the area.

Increased Loading

(*Continued from page* 350)

The economic gain from emergency ratings as adopted will still be very large, even under the most pessimistic situation we can now conceive. Should above-rating operation reduce the equipment life to the order of, say, 15 or even 12 years, the value of the equipment affected often represents a minor part of the total investment. In the case of the four-bank substation described earlier, the transformers and regulators represent less than 15 per cent of the total substation cost.

While above-rating operation has not been used long enough, as yet, to prove that its effect upon the life of equipment is of the negligible values determined by intensive experiment and analysis there is reasonable doubt that the results will be other than contemplated. In fact, the present emergency ratings are based on certain assumptions which involve such margins of conservatism that experience is expected to show that the loadings can be further increased in some cases.

The Civic Responsibilities of a Public Utility

By Henry Obermeyer

Assistant Vice-President, Consolidated Edison Company of New York, Inc.

A recent talk before a New York civic organization

WHEN a public utility is created to serve a great metropolis like the City of New York, it accepts a condition and assumes a responsibility that is unlike that of any other type of business. It is thenceforth and for all time subject to the circumstances of its environement, its corporate structure and functions being under constant scrutiny and control of a public service commission; its generating plants furnishing the essential energy, its mains and cables built into the physical structure of the city where, like the veins and arteries of the human organism, the vital force is carried to every part and particle of the region whose social and economic life is animated and indeed made possible by its operations.

The prosperity of a public utility and the well-being of the community is thereby one and inseparable. If disaster strikes or depression threatens, or if greener pastures beckon on the distant hills, no thought of pulling stakes can enter the calculations of utility management. For good or ill, its place is here, and in no other enterprise, therefore, does enlightened self-interest, that is, the incentive of being a good citizen interested in supporting every worthwhile constructive activity, brings its reward more directly and inevitably than in the case of the public utility. And by the same token, the city or town which enjoys the existence of a well managed and prosperous utility organization, dominated by a philosophy of public service, has within its own boundaries a powerful ally, a hostage to fortune.

Consolidated Edison is, first of all, a local institution in every sense of the word. With the exception of Westchester County, which it also serves with electricity and gas, it has no interests outside of the city of New York. It is big, but only because it has the biggest job of its kind in the entire world. And that means big enough not merely to supply the day-to-day requirements of the homes and industries in a city of over seven million people; it means carrying reserves to meet emergencies like that of the recently threatened coal shortage; facilities to provide power and light during six short months for the greatest fair the world has ever seen, not to mention the 15,000,000 expected visitors during the fair, nearly double the city's present population. It means capacity for tremendous future growth, not merely for a still-growing territory, but for the new uses for utility services, such as air conditioning, television, fluorescent lighting, and all the rest.

MR. OBERMEYER

For this reason we may say that almost the entire responsibility of a company like ours consists of a constant readiness to serve both the present and future needs of its customers and the public generally. It is that quality of being always on tap, instantly ready whenever you want it—and that, of course, also means all the times when you don't use it at all—that gives utility service its actual value; and that, incidentally, is probably the most costly element to provide. As a matter of fact, gas, electricity, or steam would be worth very little to any of us unless such were the case.

Consolidated Edison recognizes its obligation to the public by its often expressed policy "to give New York the best utility service possible at the lowest possible cost." That cost, which means the rates for electricity and gas established with the approval of the Public Service Commission, are determined and affected above all else by economic conditions in this area. Comparison with rates elsewhere are valueless unless all of these conditions are taken into consideration.

You may be interested in knowing what some of these are. For one thing there is the character of the population, that is, the way in which New Yorkers live. More than 75 per cent of our customers live in apartments, the majority in three, two, or even one-room apartments. They eat out a great part of the time. The result is that a large percentage do not use enough electricity even to meet the cost, estimated at an average of about $1.08 a month, of keeping their accounts and service connections. There is no market among them for many types of electric and gas using equipment such as washers, ironers, dryers and literally scores of conveniences conventionally found in private homes. Opportunities for new business, to offset the cost of serving these so-called small users, must be looked for in other directions.

Then there are the unusual, I might say unique, problems connected with the establishment of gas and power plants and the construction of distribution lines here in New York. The plants themselves occupy choice and highly assessed property on the river fronts where adequate quantities of condensing water are available and where immense amounts of coal can be delivered without paralyzing the already congested streets and highways of our city.

Old pictures of New York, taken years ago when the consumption of electricity was hardly a fraction of what it is today, show certain intersections literally darkened by the maze of overhead wires strung from poles or from building to building. Since that time, except in outlying sections, these wires have been brought underground even into the solid bedrock of Manhattan, where they now form an intricate network of cable and conduits extending in almost every direc-

tion. The city as we know it could not have survived under the old conditions; yet the method of change involved an enormous additional investment on the part of the company.

The cost of living in New York is an important factor that influences the cost of doing any business that employs labor on a considerable scale. Over 29 per cent of our entire revenue is paid to more than 35,000 employees; and one of the reasons for this proportion is the fact that the average pay of the weekly employees of the Consolidated Edison system is at least 10 per cent higher than the national average for the utility industry; higher, in fact, than that of almost any industry in the country.

And finally, though I have by no means exhausted the list of local influences affecting utility rates, is the matter of taxes. Among all the major utility organizations throughout the country, the Consolidated Edison Company of New York heads the list by a substantial margin in the ratio of its income required for tax purposes. Right here let me prevent any possible misunderstanding by saying that Consolidated Edison is not looking for any sympathetic shoulder to cry on over the fact that it is by far the largest taxpayer in the community. Rather are we proud that we are in a position to contribute so much to the economic well-being and social services of the municipality as well as to the state, federal, and county governments. The *American City* magazine, which is anything but a special pleader for public utilities, in a recent issue expressed this thought concerning one of our newspaper announcements by saying "the Consolidated Edison advertisement typifies a marked departure from the traditional complaints of public utility corporations of 'unbearable taxes' alleged to be extracted from widows and orphans and other holders of utility securities. The new type of publicity acknowledges frankly that the tax money comes from the utility's customers, but points out that the consumers, as members of the community, benefit through the expenditure of these funds by public officials, mainly for essential municipal activities, but also for state and federal services."

On the other hand, it is our right, and we believe a public duty, to see that our customers know what becomes of the money they pay us, presumably for services rendered; and exactly how much of that money is devoted to the actual rendering of those services. Last year, our total operating taxes amounted to more than $51,000,000, nearly a million dollars a week. That represented about 21 1/3 cents out of every dollar our customers paid during the year for electricity and gas. It was more than the total revenues of the entire system for the months of January and February, and double the amount and proportion of the taxes paid by the company in 1929, less than 10 years ago. Putting it in still another way, it was equal in amount to $1,329 per annum for every person employed and 61 per cent of the amount paid to all employees in the form of wages and pensions. Also, it was equivalent to $4.48 a share on the common stock (on which the shareholder received only $2 in dividends) and one and a half times the aggregate of preferred and common stock dividend disbursements. It was not long ago that people were discussing the pros and cons of public ownership of public utilities. For several years now Uncle Sam and Father Knickerbocker have enjoyed a majority interest in the profits of our business, having wisely avoided all the headaches that go with active management and responsibility. Public ownership is here, though it functions in the disguise of the tax collector.

The subject of utility taxes is one that vitally concerns both the citizen and the consumer. From the municipal standpoint it is significant that approximately two-thirds of Consolidated Edison's $51,000,000 annual tax bill that is, $31,000,000, which does not include the City Sales tax that the customer pays directly, goes to the City of New York. Based on the city budget for 1938, this is half the annual cost of maintaining the Police Department; or equivalent to the cost of running the Fire Department or the Department of Sanitation for almost the entire year. Our local tax contribution alone would meet almost one-fifth the annual cost of the public schools.

As noted once before, this increment to the public treasury is produced out of the revenues received by the utility from its customers. It would seem, therefore, a good thing for a city to have in its midst a live, well-managed organization that was active in promoting its business and thereby expanding the source and base of municipal tax receipts. We believe this to be a fact, even to the extent of vindicating the much-maligned profit motive.

There was a good example of this recently when Consolidated Edison undertook a four-months sales and advertising program that we called "Edison's Bargain Package Campaign." One bargain package was sold to better than one out of every eight residential customers on our lines. In New York City, this meant the sale of over 212,000 packages of four standard appliances each, all profits of which went to nearly 1000 cooperating neighborhood dealers; for, with few exceptions, Consolidated Edison derives no income from the merchandising of electric or gas appliances. This single activity, conducted by a business that is sometimes mistakenly referred to as a monopoly, during a four months' period added $104,000 in sales taxes to the city's treasury for the cause of unemployment relief, enabling the city to care for at least 500 additional families at the standard allowance for home relief. I mention this, although the sum is not included in the $51,000,000 of taxes referred to previously, merely to point out how the community benefits, even as a by-product, from the natural desire of the utility company to extend the use of its service—the normal activity of a progressive business enterprise.

What has happened, as we might as well admit frankly and openly, is that the modern public utility, privately owned and operated, has become an unofficial tax collector for the government, constituted in such a way that the government not only escapes the onus that would normally fall upon it in that capacity, but permits it to be shifted to the company which, according to the rules, must absorb those taxes that are levied on it and assume them as part of the price charged for its services. We are used to thinking in big figures these days, but it might startle even a modern economic planner to realize that Consolidated Edison's annual taxes of $51,000,000 are equivalent to two billion dollars of funded debt at 2½ per cent interest. The City of New York alone receives from the company an amount of taxes, based on the rate that they have to pay for money, that would be equal to over a billion dollars of assets. Nor is that all, for we should not ignore the fact that a great part of the $83,000,000 paid annually to the company's employees is subject to taxes, as is the profit from materials we purchase as well as the interest and dividends paid on our securities. So when we come to compute all the taxes that these companies have

made available to the government, it is safe to say that they would probably aggregate well over $60,000,000.

These facts are worth remembering when we consider how much would have to be added to the present levies on the average taxpayer in order to compensate for the taxes paid by the privately owned tax collecting utility. We can see this picture somewhat in reverse as it affects the opportunities for further reductions in the rates for gas and electricity. In spite of rising taxes and increased costs of labor and most of the materials that go into the cost of utility services, Consolidated Edison has achieved the somewhat remarkable feat of repeatedly lowering the rates to gas and electric customers in New York City and Westchester County during the past 10 years to such an extent that this year alone users will save $49,000,000 compared to what they would have paid at 1929 rates for the same consumption. If, besides this, the increase in taxes during the same period could have been applied to further reductions, customers might have been saved an additional amount of $74,000,000. If taxes of the Consolidated Edison system were on the same basis as those of the utility industry as a whole, the average residential rate could be reduced by 17 per cent; if we were taxed at the rates paid by the T.V.A., savings of 50 per cent could be introduced; and if we were taxed on the same basis as the Hydro-electric Commission of Ontario, we could effect a reduction of 65 per cent. Inasmuch as our actual reduction in the average residential electric rate has been upwards of 26 per cent since 1929, I think I may say that the company has done fairly well by its public, whether in the capacity of ratepayers or tax-payers. Apparently Mr. John Q. Citizen has enjoyed his cake and kept it as well.

The principal task before us, as I see it, is to so organize our facilities, our credit, and our man-power that the "world of tomorrow" so eloquently projected by the New York World's Fair, may not find itself lacking, either in kind or quantity, the motive forces that have carried the American way of life to its present stage of development.

Recently I had the pleasure of hearing one of the world's great scientists, Dr. Robert A. Millikan, of the California Institute of Technology, draw a comparison between American and foreign accomplishments, with respect to the diffusion of power machines, that should be impressed on our memories for all time.

"In this country," he noted, "there is now expended about 13.5 horsepower hours per day per capita—the equivalent of a hundred human slaves for each of us; in England the figure is 6.7, in Germany 6.0, in France 4.5, in Japan 1.8, in Russia 0.9, in China 0.5. In the last analysis this use of power is why our most important social changes have come about. This is why 10 times as many boys and girls are in the high school today in the United States as were there in 1890 . . . This is why we have now an eight-hour day instead of, then, a 10, a 12—or sometimes a 14-hour day. This is why we have on the average an automobile for every family in the country. This is why the lowest class of male labor, i. e., unskilled labor, gets nearly twice as much in real wages in the United States as in England, three times as much as in Germany or France, and 13 times as much as in Russia, and this is why the most abused class of labor in the world, domestic service, is even better off, relatively in this country though completely unorganized, i. e., through the unhampered operation of economic laws, than in any other class of labor, skilled or unskilled."

Other people have developed various methods and techniques for the purpose of making power widely available to every worker and homemaker, but so far none has approached the success of the American system of private capital in which sound economics and mutual advantage and profit are the dominant characteristics.

Consolidated Edison has recognized its four-fold obligation to the community, to its investors, to its employees, and to its customers. That obligation is the broad base on which its present policies rest, and it is likewise the direction sign which will continue to point the way to its future progress, which is toward the increasing prosperity and well-being of our great City of New York.

Woburn Crew, Winners of Matthews Valor Award, Honored by Civic Organization

THE Woburn District Transmission and Distribution crew of the Boston Edison Co., which was awarded at the E.E.I. Convention in June the Claude L. Matthews Medal of Valor, were guests of honor at a recent meeting of the Rotary Club of Woburn.

Claude L. Matthews, vice-president and general manager of W. N. Matthews Corp., St. Louis, and donor of the award bearing his name, presented individual medals to each of the 37 members of the Edison organization for their speedy restoration of service, on the night of the September 21 hurricane, to Woburn, Winchester, Stoneham and Burlington.

In his remarks, Mr. Matthews paid high tribute to the courage and ingenuity of Foreman George C. McNeill and his men for the deeds which won them the award, and congratulated the utilities of New England upon their quick recovery from the devastating effects of the hurricane. In replying, Vice-President Thomas H. Carens of the Edison company voiced the pride of the entire organization in having been awarded the distinguished honor.

"The manner in which George McNeill and his boys overcame difficulties on that wild night," said Mr. Carens, "was an outstanding example of the readiness with which our forces in the field are prepared to meet a great emergency. The work of the Woburn crews on that night was submitted in competition for the Matthews Award because it contained so many spectacular deeds of courage. But nobody knows better than George McNeill and his men that they were merely following a principle of service which has long been an integral part of Boston Edison activities. They know that throughout our system on the night of the hurricane and in the weeks that followed there were other acts of heroism by individuals and groups which contributed to the very early recovery of normal service.

"It is interesting to note that within a single week we were able to round up and bring into New England the equivalent of three years' supply of poles and enough wire to meet our normal demands for five years." Mr. Carens said. "Our happiest memory of the hurricane, however, will always be the sympathetic and tolerant attitude of our public during the emergency and their complete understanding of the problems we had to meet."

Colors of Daylight and of Daylight Fluorescent Lamps

By Samuel G. Hibben

Director of Applied Lighting, Westinghouse Lamp Division, Westinghouse Electric & Manufacturing Company

THERE have been misconceptions about the daylight color qualities of fluorescent Mazda lamps, and probably forgetfulness of the variety of colors of natural "daylight." The term "daylight" is a very broad one and might refer to a rather wide range of color since daylight itself is quite inconstant. When designating a quality of ordinary light, such as produced by the sun, or by an incandescent filament, attention is called to the fact that a figure of absolute temperature (centigrade temperature, plus 273°C and represented by the symbol "K") can be given to represent specific color or its equivalent. The Bureau of Standards of the Federal Government has at times specified the color of noon June daylight (overcast sky from the south) at 6500°K and this is at present the quality of light that the "daylight" fluorescent Mazda lamp closely duplicates.

However, the equivalent color temperature of an overcast northern sky may be some 7000°K or higher. There have been various divisions established for the color of daylight such as quality A, B, or C, as adopted by the International Commission on Illumination where daylight B would represent noon sunlight; daylight C would represent "average" daylight (tolerance limits 6300-7000K), etc.

Special "daylight" may be needed for special color discrimination work. For instance, in cotton grading, the experience seems to indicate that the best quality of daylight is that represented by some 7000 to 7400°K. Also, the absolute foot-candle intensities are important in color vision. In cotton classing for example, no less than 50 foot-candles is considered safe. Low values of illumination are unsatisfactory in close color discrimination.

Spectral distribution curves given in Figure 1 show that the daylight fluorescent lamp produces a basic curve upon which are superimposed some "mountain peaks" or narrow bands of luminosity at different wave lengths or colors of the spectrum. These peaks are of the mercury bands and come from the mercury light that leaks through the phosphor coating, chiefly in the deep blue at roughly 4350 A (A = Angstrom = wave length of .0000001 mm.) and in the yellow-green at about 5460 A. In the total output measured in lumens these bands add less than three lumens per watt to the total, and they blend into the phosphor luminescence, but they would suffice to slightly distort a color that might happen to just correspond to the band or mountain peak.

More technically exact reproductions of daylight are possible using the larger wattage Mazda filament lamps behind scientific color screens of blue glass. Or by varying voltage and by an interchange of differing screens, or a difference of glass thickness, one may rather closely duplicate almost any desired quality of daylight and hence these filter-units are still standard and dependable for exact "daylight" color matching regardless of the reflecting qualities of the material under observation.

A 10 per cent voltage drop will, with a daylight fluorescent lamp, cause approximately a 10 per cent drop in lumen output but with no appreciable change in color. By contrast, this voltage change on a (16 lumens per watt) Mazda filament lamp reduces the lumens by about 30 per cent and may change the color temperature from say 2850K to 2750K.

Note carefully the distinction namely, that daylight fluorescent Mazda lamps serve excellently for average color discrimination, for general observation of colored materials, for discriminating merchandise displays, the illumination of colored flowers, objects, and most industrial processes. Except in the very deep violet, and in the deep red, the daylight phosphor is a reasonably close duplicate of sunlight. However, where manufacture of dyes or careful grading of white or lightly tinted materials is necessary, the basic scientific unit for the more exacting (though not perfect)

(*Continued on page* 370)

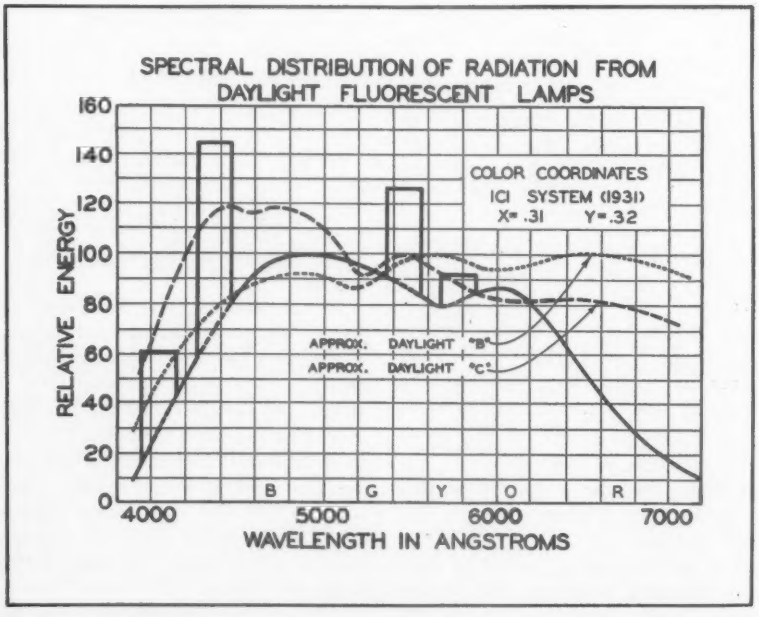


Fig. 1—Two qualities of daylight compared with the fluorescent Mazda lamp.

Commercial News Notes

By C. E. Greenwood
Commercial Director, Edison Electric Institute

Rural Sales Conference

THERE have been many heavy discussions in the old country barn but not always in the hayloft. The Model Electric Farm at the World's Fair will not have a hay crop this summer to store and the management offers the space for get-togethers of many varied groups.

Quite fitting it is that the first Rural Sales Conference of Edison Electric Institute should be scheduled to meet in the HAYLOFT of the "Edison Barn" which has a seating capacity to take care of the utility and manufacturer representatives expected to attend this Conference on Sept. 21-22. On September 21 there will be an all-day formal speaking program by leaders in the field of rural sales development, and this will be followed on the second day by a Round-Table discussion.

The Electrified Farm covers but one acre of ground, yet the many services available to the farmer are visualized. This will be a fitting atmosphere in which to hold such meetings.

New Wiring Booklets

Everyone engaged in load building activities is familiar with the obstacles to be overcome in bringing to the consumers of electricity adequate copper capacities in all classes of structures. This has been the bugbear of the industry for many years. There has been effective research in the field and prolific discussion of the problems involved, and from time to time solutions have been offered. But perhaps the greatest forward step is the practical one visualized in a series of three booklets to be issued this month by the Edison Electric Institute. Readers will find announcement of these booklets on page 337 of this issue. The series includes presentations on *Basic Factors of Adequate Wiring; Covered Neutral Cable Helps Sell Adequate Home Wiring; and the Commercial Building Rewiring Market.*

The electrical industry including inspectors and wiremen; the building industry including architects; builders and building service agents, will realize that safe, effective and low-cost methods of obtaining adequate wiring for the many appliance services are available to them.

Every utility man should promote the common advantages to be gained by the general adoption of such material and methods in modernizing old structures. We have done a lot of talking about adequate wiring. Opportunity lies ahead to hurdle one of the most serious obstacles. And once every group understands the profit possibilities for all groups, and the general benefit to the electrical consumers, rapid progress is assured.

Better Light-Better Sight

There will be a mild echo of the Jubilee of Light in the month of October which is the Sixtieth Anniversary of the Incandescent Lamp. THE DAWN OF A NEW DAY through BETTER LIGHT-BETTER SIGHT will be the coordinating theme for aggressive promotion of light for seeing.

Starting September 24 the Better Vision Institute will promote Better Living through Better Vision, which is a strong opener for the light and sight activities planned for October by the cooperating units in the Better Light-Better Sight Bureau. The 1939-40 lighting season will therefore be ushered in with a gusto that should continue throughout the season.

Readers of the *Better Light-Better Sight News* saw in the June issue some of the promotional material which would be available through the bureau. A Plan Book is about ready for wide distribution; attractive display pieces, posters, newspaper mats and other items are expected to be distributed by the thousands. The usual industry stimulation will again push us forward in our job of interpreting correct lighting to the public.

Commercial executives *are urged to be watchful* for further announcements.

OVER THE FOUR MILLION mark is the record of sale of IES "tagged" lamps since this improved type of lamp was introduced to assure Light for Seeing. The scientific lighting idea has been sold so that it is estimated another four million have been marketed without tags.

The peak year was in 1936 when sales exceeded a million. Most inspiring in the record of development in these lamps is the combination of scientific principles of lighting combined with styling to please even some of the interior decorator fraternity. The Blue Ribbon series of lamps produced last year was an example of what can be done to add beauty to light value.

Modern Kitchen Program

W. H. Sammis, vice-president, Commonwealth & Southern Corporation, has now taken the helm and will steer the Modern Kitchen Bureau in its forward progress.

The retiring chairman, G. E. Whitwell, vice-president, Philadelphia Electric Company, has given a whole-hearted, forceful and effective service as chairman since the formation of the Bureau, and has brought it to a perfected and smooth running organization. Mr. Whitwell will continue on the executive committee of the bureau. The companies represented in the Commonwealth & Southern properties have been enthusiastically promoting electric kitchen equipment for many years, and in Mr. Sammis we have a man of experience in committee work who is likewise sympathetic to the objectives of the bureau. The Fall Program will include five avenues of effort —electric cooking, electric water heating, electric refrigeration, electric roasters and the promotion of the electrified kitchen idea itself. The initiation of a new styling for the kitchen, in which modernization and electrification have become synonymous, is the important background for ensemble selling.

Getting its inspiration from the World's Fair, a National Electric Range Exposition will be conducted during September and October. This means that the utility or dealer will conduct his own electric range exposition in his own store. In other words there will be synchronization of hundreds of these valuable displays for which tie-in material such as window banners, direct mail folders, newspaper copy and radio spot announcements will be made available.

The criticism of the uninitiated that

electric ranges are slow, and cost of operation is high, has been blasted in advertising of the past and for this year the cleanliness and safety of electric ranges will be the high spots for industry attention.

National advertising in the September, October and November issues of *Better Homes and Gardens,* stressing the advantage of electirc water heating, and directing the reader to his electric service company to ask about the low electric rates for this service, takes the place of the National advertising on electric ranges. A TIME TO CHANGE campaign has been prepared, again for local use. Promotional material will include a direct mail campaign of two pieces, a series of five newspaper advertisements, a selling guide which acts as information for salesmen and also for prospects. Another feature of the water heating activity is a Retail Salesmen's Contest for the best letters on the subject, "How I Sell Electric Water Heaters." And, of course, the major prize of $1,000 for the utility doing the best all-round job in the development of electric water heater load in 1939 will be featured.

The *Scotch-Eskimo* campaign which has been so successfully applied in scores of communities throughout the United States to sell electric refrigeration will be continued throughout the balance of the year. Fortunately the positive advantages of modern electric refrigerators are sold in the campaign material which consists of six newspaper advertisements, a window banner, counter cards, a sales training booklet and a direct mailing piece for consumers.

The Electric Roaster Program was an added feature of the general promotional plan this year. Extensive advertising has appeared in National media such as *McCall's, Woman's Home Companion* and the *Saturday Evening Post.* Happily the Bureau announces that another series of advertisements will be used in the October, November and December issues of National magazines. Again there will be the essential tie-in material for local consumption such as tie-in newspaper advertisements, window banners, counter cards and radio spot announcements. An added feature of importance is a sound slide film which will be furnished at cost for use at dealer meetings.

The Bureau urges continuance in selling the all-electric kitchen idea, either as a group purchase, or a step-by-step plan for acquiring complete equipment. There are available kitchen planning kits, booklets on the modern all-electric kitchen, counter cards, car cards, an animated window display sign and a sound slide film for use in publicity. The Executive Committee of the Bureau has made careful study of the needs of the utility for promotional items and the curve of the demand for promotional pieces developed by the National Bureau has been continuing a rapid upward trend.

SLUM CLEARANCE PROJECTS have become an important consideration from the kitchen equipment angle and a joint committee has been organized between NEMA and EEI to cooperate with the United States Housing Authority in producing essential data required in determining upon type of cooking equipment. W. H. Sammis is Chairman of this committee which consists of W. H. Burke and H. P. Liversidge as the other utility members, and C. E. Wilson, C. E. Stevens and H. E. Blood representing the manufacturer group.

Sales Training

The date for final commitments for proposed courses on CUSTOMER RELATIONS and RESIDENTIAL APPLIANCE SALES has been extended to August first. If interest warrants, the Institute will proceed with the development of these courses. The General Sales Committee recognizes the importance of better trained personnel and is attempting to give every means of assistance that is possible to obtain results.

Extensive field surveys will be required before any text books are written.

The Sales Training Committee under R. H. Fite, Jr., is proceeding with a different approach to the training of employees for better public relations in a combination course of sound slide film and Leader Manuals. Preparation is going forward with distribution promised for this Fall.

DEALER SALES of household equipment have been holding their own despite general business conditions. In fact, the dealer has been doing the lion's share of the selling for the past few years, and in 1938 but 14 per cent to 15 per cent of the total volume of business was sold by utility companies. The dealer in electrical equipment has become a center of interest for both manufacturer and utility in the problem of distribution. The need for more and better trained dealers and dealer sales people is impressed upon us daily.

The obligation rests on the manufacturer and utility to give all possible assistance in training those who are taking the story of electric appliance service to the consumer. The USE of the appliances is vital in utility selling and too often the dealer forgets this important phase of customer interest.

Chairman H. E. Dexter held a meeting of the General Sales Committee during the annual Convention in June and has sent out a call for the next meeting on September 20 at Headquarters of Edison Electric Institute, New York City, when final programs of committee activity will be defined for the coming administrative year.

PRIZE PAPER CONTESTS ON COMMERCIAL ELECTRIC COUNTER COOKING

The Commercial Electric Cooking Council announces a contest open to all salesmen in the commercial electric cooking field for the best papers on the subject HOW I SELL ELECTRIC COUNTER COOKING.

THE PRIZES for the best five papers are $100, $50, $25, $15 and $10 in order of their excellence.

THE CONTEST DATES are from September 5th until midnight October 31st, 1939.

THE PAPERS should be limited to 1500 words, and should be written on one side only, preferably by typewriter. Papers may be accompanied by photographs.

PAPERS should be sent to the Commercial Electric Cooking Council, 420 Lexington Avenue, New York City, any time between the dates specified.

JUDGES prominent in the electrical field will be selected to determine the winners.

WINNERS will be notified direct and publication of the winners will appear in the E.E.I. BULLETIN.

THE CONTEST is open to both utility and dealer salesmen.

This is the first real opportunity presented to salesmen in the field of electric counter cooking equipment to compete in such a contest. Those wishing to enter should write the Council for further details of Terms and Conditions.

Streamlined Electric Water Heating

By R. C. Bryce

Supervisor, Electric Range & Water Heater Sales Section, Philadelphia Electric Co.

WHEN the need for building residential load, at an accelerated pace, became apparent in 1930, the Philadelphia Electric Company selected Electric Ranges and Water Heaters as the logical means of rapidly increasing the sale of kilowatt-hours. The results since have been very gratifying.

The prime requisite for successful promotion of electric hot water service is to provide a type of installation that will produce an adequate supply of hot water at reasonable cost. This has been the guiding principle in the developing of electric water heating load by the Philadelphia Electric Company. Not simply to sell a large volume of electric water heaters but rather to provide a satisfactory service for every customer whose needs can be served under "Off-Peak" operation has been the aim of the company.

The soundness of this program is best illustrated by the fact that the electric water heater proved to be not only a revenue producer for the company, but also the most satisfactory electrical appliance merchandised by the company.

At the present rate of increase, the average annual domestic use per customer will exceed 1000 kwhr before the end of the year 1939. Today the company has approximately 45,000 electric ranges and 20,000 electric water heaters on its lines. The average annual increase in domestic load for the past three years has not been less than 75 kwhr per customer. Much of this increase is the direct result of the successful promotion of electric water heating. For the past several years, installations of electric water heaters on the lines of the company have exceeded the number installed by any other operating utility in the country.

Research

When it was decided to promote aggressively the sale of storage water heaters, the equipment then available was not considered satisfactory. Improvements were required and test specifications were established to determine whether the performance of heaters complied with the company's requirements. Incidentally, manufacturers desiring to participate in the company's "Cooperative Plans for the Sale and Installation of Electric Water Heaters" are required to have their equipment tested and are accepted only when the results of the tests are satisfactory.

By means of these test specifications, the company has been instrumental in accelerating the improvement of quality. A few of the requirements follow:

(a) Thermal insulation had to be increased to minimize heat losses.
(b) A cold water baffle had to be provided to minimize the degree of mixing cold water with stored hot water.
(c) Metallic connections to tank had to be minimized to reduce heat losses.
(d) Heat traps had to be provided in Hot outlet and Cold water inlet pipes.
(e) Fidelity of thermostats had to be improved.
(f) Maximum cut-out temperature (galvanized tanks) was limited to 160 F. to prolong tank life.
(g) Accommodation had to be provided in the crown of the tank for immersion type temperature-pressure relief devices.

The research which produced the foregoing and many other requirements of the Company's Test Specifications resulted in a reduction of approximately 20 per cent in stand-by losses alone.

Other research by the company prompted installation of an approved type temperature-pressure relief valve in every heater installed to insure a maximum of safety. In collaboration with manufacturers, efforts are being made to stimulate production of a satisfactory type thermally-operated electric circuit-opening device which will eliminate the usual spillage of water which occurs when present types of safety valves function. Incidentally, the company has established test specifications for such a device and it is expected that a satisfactory type will be available to the trade shortly.

"Off-Peak" Operation

When the company embarked on active promotion of ranges and water heaters, it was felt that the supply of service to domestic customers attains its best economic value only when both devices are used. In other words, it was believed that a large saturation of electric ranges, independent of electric water heaters or vice versa, was not desirable because the load of either device alone would increase the cost of supplying the device beyond the profit level.

The lowest utility cost to serve the water heating load will result when minimum demands are added by the water heating load. Under this condition, capital costs to serve are minimized, the load factor of existing investment is improved and a substantial proportion of gross revenue will be reflected in operating income.

It was determined that the water heaters should be operated on a time-controlled "Off-Peak" basis, and that the number of water heater installations should approximate 50 to 60 per cent of the number of ranges installed.

These considerations, the versatility of the electric water heater and a study of domestic load curves prompted use of an "Off-Peak" schedule. Charging hours are from 10:30 p. m. to 4:00 p. m. of the day following. In other words, electric supply to the heaters is available for 17½ hours daily. The service is interrupted by a time switch which is furnished.

A volume of business is necessary to obtain the real advantages of water heater load, with respect to filling the valleys of the daily load curve with little if any increase in the maximum demand on the system. Further, it is necessary that a competitive rate for heating water be available to obtain and hold the business. To this end, the company supplies "Heat-Storage" service at 9 mills per kwhr. This service is separately metered and a minimum charge of $1 per month prevails.

Type Heaters

Under "Off-Peak" operation it is essential that careful attention be given to the matter of installing the proper size heater for the particular family. This problem has been simplified for our sales personnel by schooling them in the application of several rules of thumb.

Only 50 and 80-gallon heaters are supplied by the company. Both heaters have single lower elements. Heat storage installations are 230 volt, alternating-current, 2-wire, single-phase, 60 cycle. The standard installed wattage of the 50-gallon heater is 1500 watts, and 2500 watts for the 80-gallon heater.

These installed wattages approximate 30 watts per gallon of storage capacity. This factor represents a compromise between minimization of demand on the system and the wattage necessary to insure all of the water in the heaters being at cut-out (150 F.) temperature at 7:00 a. m. each day. Also, this ratio serves very satisfactorily with respect to replacing the hot water withdrawn from the tanks during the period of 7:00 a. m. to 4:00 p. m. daily so that the heaters will enter the "On-Peak" (shut-off) period with most if not all of the water in the tanks at 150 F.

When capacity in excess of 80 gallons is required, two or more heaters are connected in parallel to serve the customer's requirements—or separate heaters are installed to serve separate sections of the residence.

The limitation of sizes available for sale minimizes stock investment and simplifies matters materially. Heaters under 50 gallon capacity are not considered because generally they do not provide sufficient storage to carry through the daily period (4:00 to 10:30 p. m.) during which no energy is supplied to the heaters. A 66-gallon heater is not stocked because its selling price is not much lower than the list price of the 80-gallon heater and the latter costs little if any more to operate.

Round type heaters only are featured as practically every heater sold is installed in the basement.

Sizing Heaters

Many steps could be detailed as a guide to determining the size of heater necessary to supply any family. This subject can be complicated by considering such items as water pressures, taking readings of the cold water meter, trying to determine the amount of hot water required for baths of various depths in a given size bath tub, the number of hot water outlets, length of pipe runs and so forth. While it is interesting to know how to use such data, it is not necessary for run-of-the-mine selling. Good salesmen have no desire to become engineers. We simplify the matter for our sales personnel by reducing details on this subject to bare essentials.

The Philadelphia Electric Company sales organization understands that:

(a) Under the company's schedule of installed wattages and charging hours, an automatic heater will deliver daily about one and one-half times its rated storage capacity of water heated 100 F. above cold water temperature. In other words, a 50-gallon heater will deliver a maximum of about 75 gallons and an 80-gallon heater will approximate 120 gallons per day where the hot water is withdrawn in average fashion.

(b) The water heated per hour or recovery rate for a 50-gallon heater is 6 gallons per hour and 10 gallons per hour for an 80-gallon heater on the basis of the particular installed wattages.

(c) The average family wash (clothes) requires 30 to 40 gallons of hot water.

(d) About 12 gallons of 150 F. water is required for mixing with cold water for the average tub or show bath.

(e) Although all of the water in the tank be at 150 F. at 4:00 p. m. (beginning of shut-off period) the amount of hot water available must be regarded as less than the actual storage capacity of the heater by virtue of the zone where incoming cold water mixes with stored hot water. This zone approximates 10 per cent of storage capacity and moves upward in the tank as hot water is used.

(f) The storage capacity of the heater must be such as will provide a reserve of several gallons of 150 F. water per person after the customer's daily peak use of hot water has been supplied.

With these facts in mind the salesman is required to consider:

(1) The number of persons in the family (counting each child as an adult and each servant as two persons).

(2) The day on which the greatest amount of hot water will be used and the hours of this maximum day during which the greatest withdrawals will be made.

(3) The greatest number of baths likely to be taken after 2 p. m. on any day.

(4) Whether laundry is done at home and if so by what means.

(5) The standard of living of the family.

By tactful questioning, the salesman determines the nature and time of the peak withdrawals. Knowing the quantities of water required for the various purposes and that a reserve margin must be maintained, he is able to gauge the size of heater necessary.

About 65 per cent of electric water heaters sold by the company are 50-gallon heaters. This capacity is adequate to provide sufficient hot water for the average family in the Philadelphia area.

Installation Policy and Procedure

The company's installation policy and procedure is designed to insure that its customers are supplied with approved type heaters of correct size and that the heaters be properly installed. Thus only can a maximum of safety and efficiency be assured.

The company contributes toward the cost of installing approved makes of heaters. To obtain eligibility for installation allowance, manufacturers are required to have their heater tested (at their expense) by the company's authorized testing agent. The tests must be in accordance with the company's testing procedure (EEI Publication No. F8—NEMA Publication No. 103). The results of the tests are used to determine whether the product is eligible for listing.

Every sale of a heater for installation on the company's lines, whether by the company or a dealer, is surveyed by an estimator employed by the company. The estimator is schooled to determine whether the heater is of adequate capacity to serve the customer. Where an improper size has been sold he returns the request for installation to source with his recommendation.

Where the capacity of the heater sold is satisfactory, the estimator prepares specifications for the installation. The job is awarded to a contractor-dealer under a competitive bidding system. Within 48 hours after the heater has been installed, the estimator inspects the contractor's work to insure that the installation specifications have been complied with and that the equipment is operating satisfactorily.

Summary

Water heating is another job which can be done better with electricity than with any other fuel. An electric water heater will use more kilowatthours than the total for lighting and all other devices in the average home. It is a service which customers can afford to buy.

Consumer acceptance of this product can be created readily and should be as the next logical step towards the "All-Electric Home."

Capitalize on the "Romance" value of electric water heating.

Colors of Daylight and of Daylight Fluorescent Lamps

(*Continued from page* 366)

work still consists of the proper combination of a Mazda filament lamp and its daylight glass filter.

There need be but few overlapping fields of application. The latter unit is a scientific instrument adjustable for different degrees of daylight and for very exact color matching jobs. The daylight fluorescent lamp is not adjustable in quality by voltage variations or other means from its basic 6500°K daylight quality and it is properly applied for color discrimination, color enhancement and an average reproduction of an average of one kind of daylight color.

"Dawn of a New Day" Is Theme For Better Light-Better Sight Program

"THE Dawn of a New Day Through Better Light-Better Sight" will be the unifying theme of Better Light-Better Sight promotion scheduled for the coming fall and winter months, as announced recently by the Executive Committee of the Bureau. Detailed programs are being developed, not only by the Bureau itself, but also by many of the sponsoring groups.

Among the most important of the activities now planned is a concentrated Better Vision drive which is scheduled for most of September. Responsibility for this effort has been assumed by M. J. Julian, president of the Better Vision Institute. Optical interests will lead the way, but the campaign is on so broad a basis that it deserves, and is expected to obtain, the support of every individual or group working for the furtherance of the Better Light-Better Sight movement.

Mr. Julian reports that arrangements have already been made for a special issue of the *Bulletin* of the Better Vision Institute, which will go to more than 6500 members of the Institute. This publication will emphasize the importance of the drive and will present a wide variety of promotional material for use by members and others. There will be a complete series of newspaper advertisements; suggested letters, radio shorts and many other items. The support given by utility and electrical groups to the Better Vision activity will be emphasized, and the optical men will be urged to arrange for local cooperation with these groups.

In support of the *Bulletin*, Better Vision Institute will carry out a publicity program which will include news releases to 2000 newspapers and 600 radio stations. Special electrically recorded radio programs will be prepared, and it is also expected that additional broadcasts will be arranged over the Columbia and National Broadcasting networks.

Materials and suggestions from the National Better Light-Better Sight Bureau, covering the whole fall and winter period as well as the Better Vision campaign, will be issued in the form of a Plan Book, which is now ready for distribution. Among the items announced

in this Plan Book are the sound slide film for children; a series of newspaper advertisements of various sizes; radio scripts, displays, and much other material.

Work is now under way on a large display piece suitable for windows, shows, exhibits, etc., which is to incorporate the new theme, "The Dawn of a New Day Through Better Light-Better Sight," and also on several smaller display pieces. Ashton B. Collins is laying plans to have Reddy Kilowatt participate in his usual effective way.

The Bureau plans to make use again of a device which has always proved successful in the past—a sample newspaper page incorporating interesting news and feature items concerning various phases of the Better Light-Better Sight movement. Space is provided on this page for a number of local advertisements. With utility companies taking the largest advertising space, many newspapers have found it profitable to obtain related advertising to fill the page, and to run it in its entirety.

A spread sheet picturing successful exhibits, shows and demonstrations of past years is contemplated, as is an outline of at least one contest suitable for use in any locality.

In the opinion of the National Better Light-Better Sight Bureau the accumulative effect of the past five years' efforts on Better Light-Better Sight is now reaching a point where the most intensive sales promotion is needed to capitalize fully on the solid foundation built.

J. E. North, Chairman of the National Better Light-Better Sight Bureau, in a recent speech at the New York World's Fair emphasizing the "Dawn of a New Day" theme, said "Old eyes and young eyes will be brighter in the world of tomorrow," thanks to advancements in lighting, and stay bright longer. Light will guard the safety of pedestrians and drivers on the streets and highways of tomorrow. The astounding number of fatal accidents which occur nightly because of inadequate street and highway lighting will not be a public plague. Traffic will move as fast and with as little confusion at night as by day. Thanks to this improved lighting, our thoroughfares and boulevards will become arteries of civic beauty to which we will point with justifiable pride.

"The dawn of a new day through Better Light looms before every one of us who uses his eyes in any kind of human endeavor—a new day that begins whenever natural light is insufficient for comfortable use of the eyes. The eyes of all mankind will be the chief benefactors. Natural abilities and talents can be utilized more effectively for individual improvement and personal advancement. Students will be able to learn faster and easier and parents' eyes see better and tire less quickly."

Michigan Association Meeting

MORE than 400 utility representatives attended the meeting of the Michigan Electric Light Association, held at Mackinac Island, June 29-July 1. Edward Vennard, Vice-President, Middle West Service Company told the meeting that a major problem of industry is to meet militant attacks of minorities who sincerely believe that the present private enterprise-profit system is not in the best interest of all.

Mr. Vennard pointed out the possible effects of a hostile public sentiment against business in general and stated that the chief problem was to win more favorable public relations.

This situation can be met, he said, by telling the public the true story, by adopting policies and practices that will win public approval and by an approach to employee and public relations on the basis that this is the biggest single job confronting executives and supervisors.

A round up of utility progress was the theme of President W. C. Blanchard of Michigan Public Service Co. He cited statistics of the industry covering 1938 operations and showed that Michigan had moved along in conformity to the general trend.

The importance of personnel was stressed by B. A. Thornton of Indiana and Michigan Electric. He pointed out that the economic value of utility personnel was about equal to the value of physical assets with an investment per employee higher than is found in other industries.

In 21 Michigan towns having junior high schools General Electric has sponsored an educational program for lighting that is accepted as well worth while by educators. A manual has been prepared for teachers and students which they purchase and General Electric loans the light meters through which the tangible aspects of the work are developed. G. T. Bogard told of the project and said results to date were encouraging.

Interest in the new fluorescent lighting was exhibited when T. P. Brown of General Electric and W. A. Stannard of Consumers Power discussed its theory and application.

A dirt farmer, W. C. Schoof, told how he had developed a complete electric home and electrified farm operations at a profit as well as living on city standards. He operates 123 acres of diversified farm area with some dairying. On his farm operations, he figures a total cost of $219 a year as against a cost of $650 a year by use of old methods, and this saving more than pays for his electrified home where electric bill is $11.40 a month. He uses portable motors and specially designed equipment on the farm and said that the use of electricity had not only made him money; it also made him, his family and his labor contented and happy.

A forum was held on selling. Electric cookers were urged as good build-up items toward the ultimate use of major appliances. L. L. Clemmer discussed the refrigerator trade-in situation and said the industry was paying too much for old ice boxes and old refrigerators. He suggested some standardization in practice such as is had in automobile sales. He urged that the price paid should be based upon reconditioning cost, the price at which the old unit could be sold and the cost of handling and reselling. The refrigerator business has reached a stage of saturation and a marketing condition where trade-in practices should be given serious study by the industry. C. J. McQuiggan led the discussion on sales to minimum use customers and O. P. B. Johnson on sales of electric water heaters.

M. W. Arthur, vice-president of Consumers Power Co., was elected president for the coming year.

Canadian Association Meeting

THE annual convention of the Canadian Electrical Association held at Digby, Nova Scotia, June 21-24, attracted 275 delegates and guests for the three and one-half day meeting. Among the guests were Dr. T. H. Hogg, chairman and chief engineer of the Hydro-Electric Power Commission of Ontario, Prof. H. W. McKiel, president of the Engineering Institute of Canada and Premier Angus L. Macdonald of Nova Scotia, who delivered an interesting address at the annual banquet.

Reports were heard from 24 committees. Special papers delivered included: "Our Common Objective" by J. S. Keenan and H. H. Rimmer, Canadian General Electric Co.; "Pressure-Treated Pine Poles" by A. R. Colman, Bell Telephone Co. of Canada; "Mechanical Analogy of Transmission Line Surges" by Charles F. Wagner, Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa. and "Dealer Dividends" by W. C. Mainwaring, B. C. Electric Railway Co., Ltd.

In introducing the Premier of Nova Scotia at the annual banquet, Maurice C. Gilman, president of the association, stated that Mr. Macdonald recognized the unjust discrimination that frequently exists through wrong taxation, and that he understood that in Nova Scotia the unequal taxation of government and privately owned utilities would soon be eliminated.

In his president's report, Mr. Gilman reviewed the activities in which the association participated during the past year, and commented briefly on the present status of the electric uility business in Canada.

"At the end of 1938," Mr. Gilman said, "there was approximately $1,500,000,000 of capital in our electric utilities, an increase of 56 per cent over the figure of ten years ago. This large investment represented 7,430,000 hp. of installed generating capacity, which is an increase of 60 per cent in ten years. With this generating capacity, a total of approximately 26,000,000,000 kwhr were produced in 1938. This in turn is 59 per cent more than our output of ten years ago. . . . However, these figures do not tell the whole story. In 1938 the revenue which our utilities received, totaled approximately $137,000,000. It is important to realize that this figure is only 22 per cent higher than that of ten years ago. Thus, while the capital investment, capacity and output of our utilities has increased in a decade by approximately 60 per cent, our annual revenue from the sale of electricity has increased but a little more than 20 per cent. In other words during this ten-year period the average price of our product has decreased more than 20 per cent. How many other services or commodities do you know that are available to us today at prices 20 per cent below those of ten years ago? . . ."

J. E. Lawson of the Canadian Niagara Power Co., was elected president of the association for the coming year.

Public Utilities Advertising Association Convention

WITH one of the largest attendances on record and the most representative from a geographic standpoint, the annual convention of the Public Utilities Advertising Association, held in New York City, June 19-22, was pronounced the most stimulating and productive yet held.

Officers elected for the year 1939-40 were: President, E. K. Hartzell, East Tennessee Light and Power Company, Bristol; First vice-president, H. J. Rowe, Iowa Electric Light and Power Company, Cedar Rapids; second vice-president, Al C. Joy; third vice-president, Clara H. Zillessen, Philadelphia Electric Company; secretary, H. W. Olcott, Bozell & Jacobs, Inc., Indianapolis, Ind.; treasurer, T. H. Spain.

A high spot of the convention was the presentation of 59 awards to winning companies in the 1939 Better Copy Contest. Among the awards to electric companies were the following:

Public Relations Newspaper Advertising
Premier Award—Consolidated Edison Co. of New York, Inc.
Load Building Newspaper Advertising for Electric Companies
Premier Award—The Cincinnati Gas & Electric Co.
Merchandise Newspaper Advertising for Electric Companies
Premier Award—Southern California Edison Co.
Campaigns
Awards of Exceptional Merit—Philadelphia Electric Co., Consolidated Edison Co. of New York, Inc., Wisconsin Public Service Corp.
Employe Magazines
Premier Award—Philadelphia Co.
Employe Newspapers
Premier Award—The Cincinnati Gas & Electric Co.
Domestic Bill Enclosures
Premier Award—West Penn Power Co.
Direct Mail Advertising
Premier Award—Philadelphia Electric Co.
Special Booklets, Pamphlets, etc.
Premier Award—Georgia Power Co.
Electric Window or Inside Display
Premier Award—The Cincinnati Gas & Electric Co.
Radio Advertising
Premier Award—Consolidated Edison Co. of New York, Inc.
Motion Pictures for Public Presentation
Premier Award—Public Service Electric & Gas Co.
Award of Merit—Consumers Power Co.
Special Award—Pacific Gas & Electric Co.
Sound Slide Films
Premier Award—Public Service Electric & Gas Co.

President Howard F. Weeks, Consolidated Edison Company, opened the Monday morning session, June 19, and the keynote speaker was Floyd L. Carlisle, chairman of the Consolidated Edison board of trustees. He noted the progress in advertising to a broader function, as evidenced at the Fair, of dramatizing the "American way." He said that the utility industry has adjusted itself to changing conditions better than other businesses, and spoke optimistically about recent trends.

Mr. Carlisle pointed out that a good deal of his hope for a change in the country's affairs was based on his feeling that the man in the street is beginning to realize that he cannot get money simply by printing it and that he cannot spend without producing. He declared that great lessons have been learned out of the depression and as a result many industries are in a much better condition than ever before.

C. W. Kellogg, president of the Edison Electric Institute, spoke in detail on "Our Three-Sided Responsibility" to investors, customers, and employees.

Thomas Carens, Boston Edison Company, related in interesting fashion his company's experiences during the 1938 hurricane. His conclusions were:

Be accurate and frank in answering telephone inquiries; set up more and decentralized service points; there is no substitute for paid advertising in getting a message to the public; don't worry about your advertising budget in an emergency; tell the truth to create patience and understanding among customers; impress on the community that utilities have come a long way in efficient and speedy service.

In a vigorous talk on "Humanizing a Business Institution," Merryle Stanley Rukeyser, Economic Commentator for the Hearst newspapers and International News Service, urged that a strong affirmative tone be used in institutional advertising.

Feature of the Tuesday morning session was a stimulating paper by Kenneth Magers, Cincinnati Gas and Electric Company, on "How to Improve Institutional Advertising." He declared that many utilities appropriate "millions for profit but not one cent for perpetuity" because they do little or no public relations advertising.

Al C. Joy, Advertising Manager of the Pacific Gas and Electric Company, San Francisco, enlivened the convention with an illuminating dissertation on tax advertising. Mr. Joy showed his listeners a wide assortment of tax advertisements that have been run by utilities, discussing each. In summarizing, he said, "tax advertising can be one of the most valuable types of institutional advertising, or it can be one of the least valuable. Even at its worst, and by that I mean its failure to conform to my own ideals, which after all are as likely as not all wrong, I do not believe the money spent for it is entirely wasted.

As Chairman of the committee to study the usefulness of advertising material prepared by electric and gas appliance manufacturers for use by local utility companies, H. S. Metcalfe brought the convention a comprehensive report.

Touching on the high spots, Mr. Metcalfe revealed a wealth of data secured by his committee. Surveys made among utilities formed the basis of much valuable information for manufacturers in preparing future advertising material, to make it more effective for local use.

In stating its conclusions, the report presented by Mr. Metcalfe said in part: "Any manufacturer, large or small, who wants to see his material more widely used, may well heed the oft repeated utility plea to offer material of a more general promotional nature than mere brand ballyhoo.

"If he is a large manufacturer, he can get more of his material used by cooperating with the smaller utilities, many of which depend upon outside help for their advertising. It does not seem unreasonable to suggest that the large manufacturer prepare two sets of material. One of these sets, emphasizing a particular product, would be for utilities that sell merchandise. The other set, more promotional in character, would be for companies that do NOT sell merchandise.

"Promotions of a general national character, such as the Modern Kitchen Bureau, Better Light-Better Sight Bureau, Adequate Wiring for the Home, etc., are shining examples of the more successful cooperative plans. If it is not practical for manufacturers to pay attention to the local problems of the utilities, their efforts might well be directed along the lines of these plans that are already operating successfully."

The essential details as to the how, who and why of the study are contained in the report which is to be sold to members of the Public Utilities Advertising Association for $1.00, and to non-members for $2.00 per cent.

Orders for copies should be accompanied by check in the proper amount made payable to Harold S. Metcalfe, West Penn Power Company, 14 Wood Street, Pittsburgh, Penna.

Research Committee Reports on Grounding Investigations

AT a meeting of the American Research Committee on Grounding, held in New York on June 23, 1939, its Technical Subcommittee reported the progress made on the investigations of electrical grounding on pipes within buildings, to the representatives of the fourteen national organizations cooperating in this enterprise. The report covered the eighteen investigations which have been made since the previous meeting about a year ago. Twenty-seven cases had been reported on previously. In addition to the field investigations a thorough review was made of the fundamental studies being carried on by the Technical Subcommittee.

Field Investigations

The subcommittee has spent considerable time and effort investigating individual cases in the field where difficulty with either pipes or their contents might have been attributed to the effects of stray alternating current on the pipes as a result of electrical grounding. Several of these cases have added considerably to the committee's understanding of this general problem, while others seem to contribute relatively little in additional information.

One of the investigations involved a gas fire which resulted in serious damage to the building. In this case the gas meter and regulator valve had been disconnected for repairs, and the service plugged without shutting off the gas supply from the 5-lb. street main. When the repairs had been completed and an effort made to reconnect the equipment, the gas ignited. The investigation showed that the grounding wire of an ac/dc radio set had been connected to the interior gas piping, which was very limited in extent and not grounded when disconnected from the service. It is probable that the normal current through the condenser of this radio set created a spark when the contact between the interior piping and the grounded street piping was made in the process of attempting to replace the meter. Another case involving a radio ground was investigated where a workman received a shock between disconnected house piping to which a radio set was connected and a grounded steam heating boiler.

Two of the most interesting cases investigated by the committee involved adjacent residences where copper tubing had failed within 2½ years of installation. In the first residence two sections of interior tubing had failed and some other sections were badly pitted on the inside. Still other sections carrying the same water at approximately the same temperature were in excellent condition. In the second house only one section of the tubing had failed. In the first house no stray current was found on any of the interior piping, but in the second house there was stray current on the interior piping. The copper tube service pipes to both houses, which carried unbalanced neutral currents, were found to be in good condition. Analyses of the various sections of pipe removed from these houses reveal that they all conform to the ASTM Specifications for copper tubing—99.9 per cent pure coper, free from cuprous oxide. At the present time the committee is studying the effects of the variables within the 1/10 of 1 per cent impurities permitted by the standard specifications. The analyses so far indicate that the small differences in some of these impurities may go far to explain the difference in corrosion of these pipes. In this case the water involved could be classified as a border line water as far as corrosiveness is concerned.

In several cases blue staining of plumbing fixtures were involved. In two of these, the houses were new and the staining disappeared after several months. In other cases corrosive water and various combinations of different metals in the piping system seem to be contributing factors.

Rather extensive studies have been made of the effects on electrical grounding of the use of cement-asbestos mains instead of metallic mains. In one case the Water Company was planning to replace an 800-ft. dead-end cast iron main with a cement-asbestos main. This gave an opportunity for a study of conditions with the two types of mains. In another location the committee made an investigation in an area where cement-asbestos mains were extensively used. With cement-asbestos mains it was found that the individual water service might have a relatively high resistance to ground and and that the main itself was essentially an insulator. In practically every case through contacts within the house other structures such as gas piping, sewer piping, etc., contributed to lowering the overall resistance to ground. However, in several situations a low resistance to ground was obtained only through the paralleling of the individual ground of many customers through the power system neutral.

Fundamental Laboratory Studies

Fundamental laboratory studies of the corrosion of metals with superimposed alternating and direct on galvanic cells is being continued. Apparatus has been developed such that instantaneous polarization effects can be studied. To date the tests have been made with copper electrodes in 1/10 normal sodium chloride solution. The studies have included various values of alternating and direct current, both separately and in combination. The tentative results obtained are:

1. For d-c tests the oxygen content of the electrolyte has a very important influence on the polarization phenomena.
2. The presence of alternating current has a negligible effect on the electrode potential at the current densities used in the test.
3. Alternating current superimposed on direct current has negligible effect on the polarization caused by the direct current whether the alternating current is applied before or after the direct current.

Before final conclusions can be drawn, considerably more laboratory work will be required. Further laboratory work will include electrodes of metals other than copper, other electrolytes, electrodes of diffrent sizes, and electrodes of dissimilar metals.

Pipe Test

The committee is also planning to conduct further tests on pipes carrying alternating and direct current. It is planned to carefully control the conditions of these tests so as to eliminate, as far as possible, experimental error. It is expected to determine any effects on the water samples obtained from the pipes by taste and odor rating, and by spectrographic or chemical methods of analysis. Any effects on the pipes will also be observed.

Summary

In the investigations to date the committee has found various unsafe and unsatisfactory conditions in electric wiring, water pipes, gas pipes, etc. Many of these were in violation of established good practice. However, to date the committee has been unable to find any case where electrical grounding was shown to be a material factor in causing damage to water pipes or their contents.

The committee is still anxious to obtain additional field cases where it is believed that electrical grounding might have some effect on corrosion of piping, impairment of water, sparking, or electric shock, in order that its field investigations will cover the full range of field conditions.

Meeting of the Joint Subcommittee on Development and Research

THE Joint Subcommittee on Development and Research met with its Project Committees on June 16, 1939, in New York, with Mr. Silver presiding. The following resolution was incorporated in the records:

Mr. Emerson P. Peck, member of the Joint Subcommittee on Development and Research from 1926 to 1934, died November 14, 1938. He was Chairman for the power representatives of Project Committee No. 9 from its organization in 1923 until its discontinuance in 1931, and of Project Committee 1A from 1933 until 1936. He was not only a valued member of the Joint Subcommittee, but also took active interest in the details of project committee work. The Joint Subcommittee on Development and Research, by this resolution, desires to record its profound regret at his death, and its recognition of the value and significance of his collaboration in its work.

The various Project Committees presented progress reports covering the work of the last six months. In addition to the progress reports three technical reports were presented.

Project Committee 2D—Specific Devices, presented a Technical Report entitled "Neutralizing Transformer Field Trial Near Oneonta, N. Y." This field trial was made on the Troy-Elmira line of the New York Telephone Company as an experimental remedial measure against 60-cycle induced voltages. Staged full voltage tests and automatic oscillograph observations were made to determine the efficacy of the transformers in neutralizing the effects of the 60-cycle induction. Tests were also made to determine the effect of these transformers on telephone and telegraph transmission, noise and crosstalk. The results of these tests are given in this report. There is also included a brief discussion of the preliminary work necessary in the design of the transformer installation, such as coupling and earth resistivity measurements and short-circuit current calculations.

This Project Committee presented a Special Technical Report entitled "Neutralizing Transformer for Use on Communication Circuits Entering Power Stations." This report discusses the use of neutralizing transformers on communication circuits entering power stations. These transformers are used to protect the circuits against high voltages produced by station ground potential rise. Characteristics of the different types of transformers are given and a formula is presented which may be used in estimating the effectiveness of the transformers in a particular situation. The methods which have been used in installing and protecting the transformer are discussed generally, while the final section deals with the results of operating experience, both from staged tests and trial installations.

Project Committee 2K—Coupling, presented a Technical Report entitled "Low-Frequency Induction in Long Cables—Calculation of Voltage Between Conductors and Sheath." In long cables such as toll cables the shielding action exerted by currents induced in core conductors has an important effect upon the magnitude and distribution of induced voltage in the cable. Methods and data are given in this report for calculating the voltage between conductors and sheath in such cables for a variety of terminating arrangements as regards the core conductors. The calculations are illustrated by numerical examples relating to a long aerial voice-frequency cable, and the calculated results are compared with results of field tests carried out on the same cable.

Announcement will be made when the reports are acted on by the Joint Committee on Plant Coordination.

Officers Named by Northwest Association

J. E. E. ROYER, vice-president and general manager of the Washington Water Power Co., Spokane, was elected president of the Northwest Electric Light & Power Association at its 32nd annual meeting held on June 23 in Portland, Ore. He succeeds LeRoy A. Grettum, Eastern Oregon Light & Power Co., Baker.

C. J. Strike, president Idaho Power Co., was named vice-president of the association. State vice-presidents elected were: Idaho, John D. Orr, Idaho Power Co.; Montana, R. O. Kerr, Montana Power Co.; Oregon, O. B. Coldwell, Portland General Electric Co.; Utah, W. A. Huckins, Utah Power & Light Co.; Washington, Frank Walsh, Puget Sound Power & Light Co.; British Columbia, E. H. Adams, B. C. Electric Railway Co.

Mr. Royer announced the reappointment of Berkeley Snow, Portland, as executive secretary, and the following section chairmen: accounting and busines practice, R. W. Lawlor, Northwestern Electric Co., Portland; business development, C. Patrick Johnson, Puget Sound Power & Light Co., Seattle; engineering and operation, Paul P. Ashworth, Telluride Power Co., Richfield, Utah.

CORN-ON-THE-COB AT THE ELECTRIFIED FARM

Grover A. Whalen, President of New York World's Fair, is guest of Clayton Irwin, Managing Director of Electric Utilities Exhibit Corporation, at a luncheon of garden products grown at the ELECTRIFIED FARM; *chicken, eggs and milk also from the Farm. Left to right: Jesse F. Moulton, Farm Manager, Clayton Irwin, Grover Whalen and Mrs. Moulton. Sponsored by nearly 150 Electric Light and Power Companies, the Farm shows more than 100 practical applications of electricity.*

The Electrification of Industry

(*Continued from page* 344)

Electrical Equipment Manufacturing

The electrical equipment manufacturers have also brought forth many new developments which have benefited the public directly. For example, the early Edison lamp cost $3, whereas today a 100-watt lamp costs 15 cents and gives 10 times the light. Stating it another way, the modern lamp, at one-twentieth the cost of the Edison lamp, gives 10 times the light, or an overall improvement of 200 times, not to mention the durability and long life which the modern lamp has.

We also must not lose sight of the tremendous role the electrical equipment manufacturer has played in the creation of an electric standard of living in the home.

It was not so many years ago that the average housewife had to do the family wash over a scrub-board. She did her cooking over a coal range which was dirty and hot and had very uneven control—she almost broke her back sweeping the carpets with a broom—the family health was impaired and food spoilage was high because of lack of adequate refrigeration methods.

The electrical equipment manufacturer developed the modern electric washer, the electric range, the electric vacuum cleaner, and the electric refrigerator, as well as numerous other appliances. At first these were luxuries to be afforded only by a comparatively few, but cost reduction, based on effective manufacturing methods and new developments, have reduced the price of electric appliances so that today they are considered as the common necessities of life. These reductions in cost have been made in the face of continual improvement in the product. Take the electric refrigerator as an example. It has revolutionized the keeping of food in the homes—allowing the housewife to buy more economically and to reduce food spoilage to a minimum. It has been possible to reduce the price of an electric refrigerator to less than 45 per cent of the price in 1926, because of improvement in engineering and manufacturing methods. Research and development have also improved the modern refrigerator so that it only uses 40 per cent as much energy as did a refrigerator in 1926. This, combined with the 40 per cent reduction in electric power rates over the same period, makes it possible to operate *four* 1939 refrigerators for less than the operating cost of *one* in 1926.

Another example of changing an appliance from a curiosity to a commonplace article is the electric clock. In 1926, the average price of an electric clock was $25. There were 90,000 clocks sold that year. In 1938, the average price of a high quality electric clock was $4.80, a reduction of 80 per cent—and two million, five hundred thousand people purchased clocks last year.

In 1938, electric irons cost only one-half what they did in 1926.

Likewise, electric ranges only cost one-half of their former price.

The facts that I have given you I believe prove conclusively that the use of electricity and electrical equipment in industry and in the home has had a far-reaching effect toward bringing greater employment and much more enjoyment and comfort to the American people.

The story of the development and use of electricity is outstanding. In my opinion it has been the major factor realizing the slogan: "MORE FOR MORE PEOPLE AT LESS COST." It has made possible the steady widening of opportunity for more people to possess not only electrical devices but goods from many other industries and thus has contributed and is contributing substantially toward making the world a better place in which to live.

Great as has been this contribution, I firmly believe that the things we do not now know will produce more in the future and will exert an increasing influence for good in our economic and social welfare.

CONVENTIONS AND MEETINGS

JULY

26-29 American Society of Civil Engineers, St. Francis Hotel, San Francisco, Cal.

AUGUST

21-25 Illuminating Engineering Society, Hotel Fairmont, San Francisco, Cal.

22-25 National Association of Railroad and Utilities Commissioners, Seattle, Wash.

25-26 Maryland Utilities Association, George Washington Hotel, Ocean City, Md.

SEPTEMBER

7-9 Rocky Mountain Electric League, Estes Park, Colo.

20 General Sales Committee, EEI Headquarters, New York, N. Y.

21-22 Rural Sales Conference, Hay Loft, Electrified Farm, World's Fair, N. Y.

21-22 Wisconsin Utilities Association, Accounting Section, Plankington Hotel, Milwaukee, Wis.

28-30 Indiana Electric Association, French Lick Springs, Ind.

OCTOBER

2-6 National Restaurant Association, Chicago, Ill.

5 Third Annual Conference, Commercial Electric Cooking Council, Chicago, Ill.

9-10 Electrical Equipment Committee, E. E. I., New Ocean House, Swampscott, Mass.

9-12 American Gas Association, New York City, N. Y.

9-12 National Electrical Contractors Association, Bellevue-Stratford Hotel, Philadelphia, Pa.

10-11 Transmission and Distribution Committee, EEI, New Ocean House, Swampscott, Mass.

16-20 National Safety Council, Atlantic City, N. J.

19-20 Empire State Gas and Electric Association, Westchester Country Club, Westchester, N. Y.

23-27 National Electrical Manufacturers Association, Palmer House, Chicago, Ill.

NOVEMBER

6-7 Wisconsin Utilities Association, Electric, Commercial and Technical Divisions, Schroeder Hotel, Milwaukee, Wis.